California High-Speed Rail Authority

RFP No.: HSR 13-57

Request for Proposals for Design-Build Services for Construction Package 2-3

Reference Material, Part C.3 Stormwater Management Report

04/02/2014 - RFP No.: HSR13-57

CALIFORNIA HIGH-SPEED TRAIN

Engineering Report

RECORD SET 15%
DESIGN SUBMISSION

Fresno to Bakersfield

Stormwater Quality Management Report

December 2013

04/02/2014 - RFP No.: HSR13-57

CALIFORNIA
High-Speed Rail Authority

California High-Speed Train Project Engineering

Record Set 15% Design Submission Stormwater Quality Management Report

04/02/2014 - RFP No.: HSR13-57

Prepared by:

URS/HMM/Arup Joint Venture

December 2013

Table of Contents

Tables

Figures

Appendices

Abbreviations

ADA	Americans with Disabilities Act
AREMA	American Railway Engineering and Maintenance-of-Way Association
ATS	active treatment system
Authority	California High-Speed Rail Authority
BFE	base flood elevation
BMP	best management practice
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
C.F.R.	Code of Federal Regulations
CHSTP	California High-Speed Train Project
CSMP	Construction Site Monitoring Program
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
DWR	Department of Water Resources
EIR/EIS	Environmental Impact Report/Statement
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FMFCD	Fresno Metropolitan Flood Control District
FRRP	Flood Risk Reduction Project
HDM	Caltrans Highway Design Manual
HEC	Hydraulic Engineering Circular
HMF	heavy maintenance facility
HSG	Hydrologic Soil Group
HST	high-speed train
HU	Hydrologic Unit
MS4	municipal separate storm sewer system
MTT	multichambered treatment trains
NAL	numeric action level
NEL	numeric effluent limitation
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
PPDG	Project Planning and Design Guide
PPMRP	Pollution Prevention and Monitoring and Reporting Plan
REAP	Rain Event Action Plan
RWQCB	Regional Water Quality Control Board
QSP	qualified SWPPP preparer
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDC	targeted design constituent
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
WQF	Water Quality Flow
WQV	Water Quality Volume

Section 1.0

Introduction

1.0 Introduction

1.1 Project Overview

In 1996, the state of California established the California High-Speed Rail Authority (Authority). The Authority is responsible for studying alternatives to construct a rail system that will provide intercity high-speed train (HST) service on over 800 miles of track throughout California. This rail system will connect the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego. The Authority is coordinating the project with the Federal Railroad Administration. The California High-Speed Train Project (CHSTP) is envisioned as a state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology that will include state-of-the-art safety, signaling, and automated train-control systems.

The statewide CHSTP has been divided into a number of sections for the planning, environmental review, coordination, and implementation of the project. This Stormwater Quality Management Report is focused on the section of the CHSTP between Fresno and Bakersfield, specifically between the CHSTP stations in downtown Fresno and downtown Bakersfield. During the initial planning process, the CHSTP alignment alternatives are dynamic and subject to revision.

1.2 Project Description

1.2.1 Fresno to Bakersfield High-Speed Train Section

The proposed Fresno to Bakersfield (FB) Section of the HST is approximately 114 miles long and traverses a variety of land uses, including farmland, large cities, and small cities. The FB Section includes viaducts and segments where the HST will be on embankment or in cut. The route of the FB Section passes by or through the rural communities of Bowles, Laton, Armona, and Allensworth and the cities of Fresno, Hanford, Selma, Corcoran, Wasco, Shafter, McFarland, and Bakersfield.

The FB Section extends from north of Stanislaus Street in Fresno, to the northernmost limit of the Bakersfield to Palmdale Section of the HST at Oswell Street in Bakersfield.

1.2.2 Alignments

The FB HST Section, shown in Figure 1.2-1 is a critical link connecting the northern HST sections of Merced to Fresno and the Bay Area to the southern HST sections of Bakersfield to Palmdale and Palmdale to Los Angeles. The FB Section includes HST stations in the cities of Fresno and Bakersfield, with a third potential station in the vicinity of Hanford. The Fresno and Bakersfield stations are this section's project termini.

The FB Section of the HST is divided into 10 subsections, most of which have multiple alternative alignments. Table 1.2-1 and Figure 1.2-1 illustrate the subsections and their corresponding alignments.

Table 1.2-1
Fresno to Bakersfield Alignment Subsections

Alignment Prefix	Alignment Subsection Name	Location		County	Corresponding EIR/EIS Alternative
		Begin	End		
F1	Fresno	San Joaquin St	E Lincoln Ave	Fresno	BNSF
M	Monmouth	E Lincoln Ave	E Kamm Ave	Fresno	BNSF
H	Hanford	E Kamm Ave	Iona Ave	Fresno and Kings	BNSF (Hanford East)
HW	Hanford West Bypass	E Kamm Ave	Idaho Ave		Hanford West Bypass 1 & 2
HW2	Hanford West Bypass	E Kamm Ave	Iona Ave		Hanford West Bypass 1 & 2 Modified
K1	Kaweah	Idaho Ave	Nevada Ave	Kings	Hanford West Bypass 2 (at-grade) (connects to C1 [Corcoran Elevated] or C2 [Corcoran Bypass])
K2		Idaho Ave	Nevada Ave		Hanford West Bypass 1 (at-grade) (connects to C3 [BNSF through Corcoran])
K3		Iona Ave	Nevada Ave		BNSF (Hanford East) (connects to C3 [BNSF through Corcoran])
K4		Iona Ave	Nevada Ave		BNSF (Hanford East) (connects to C1 [Corcoran Elevated] or C2 [Corcoran Bypass])
K5		Iona Ave	Nevada Ave		Hanford West Bypass 2 Modified (below-grade) (connects to C1 [Corcoran Elevated] or C2 [Corcoran Bypass])
K6		Iona Ave	Nevada Ave		Hanford West Bypass 1 Modified (below-grade) (connects to C3 [BNSF through Corcoran])
C1	Corcoran	Nevada Ave	Ave 128	Kings and Tulare	Corcoran Elevated
C2	Corcoran Bypass	Nevada Ave	Ave 128		Corcoran Bypass
C3	Corcoran	Nevada Ave	Ave 128		BNSF (through Corcoran)
P	Pixley	Ave 128	Ave 84	Tulare	BNSF
A1	Allensworth Bypass	Ave 84	Elmo Hwy	Tulare and Kern	Allensworth Bypass
A2	Through Allensworth	Ave 84	Elmo Hwy		BNSF (through Allensworth)

Alignment Prefix	Alignment Subsection Name	Location		County	Corresponding EIR/EIS Alternative
		Begin	End		
L1	Poso Creek	Elmo Hwy	Whisler Rd	Kern	Allensworth Bypass (connects to BNSF [through Wasco-Shafter])
L2		Elmo Hwy	Poplar Ave		Allensworth Bypass (connects to Wasco-Shafter Bypass)
L3		Elmo Hwy	Whisler Rd		BNSF (through Allensworth) (connects to BNSF [through Wasco-Shafter])
L4		Elmo Hwy	Poplar Ave		BNSF (through Allensworth) (connects to Wasco-Shafter Bypass)
WS1	Through Wasco-Shafter	Whisler Rd	Hageman Rd	Kern	BNSF (through Wasco-Shafter)
WS2	Wasco-Shafter Bypass	Poplar Ave	Hageman Rd		Wasco-Shafter Bypass
B1	Bakersfield Urban	Hageman Rd	Baker St	Kern	BNSF (Bakersfield North)
B2	Bakersfield Urban	Hageman Rd	Baker St		Bakersfield South
B3	Bakersfield Urban	Hageman Rd	Baker St		Bakersfield Hybrid

This page intentionally left blank.

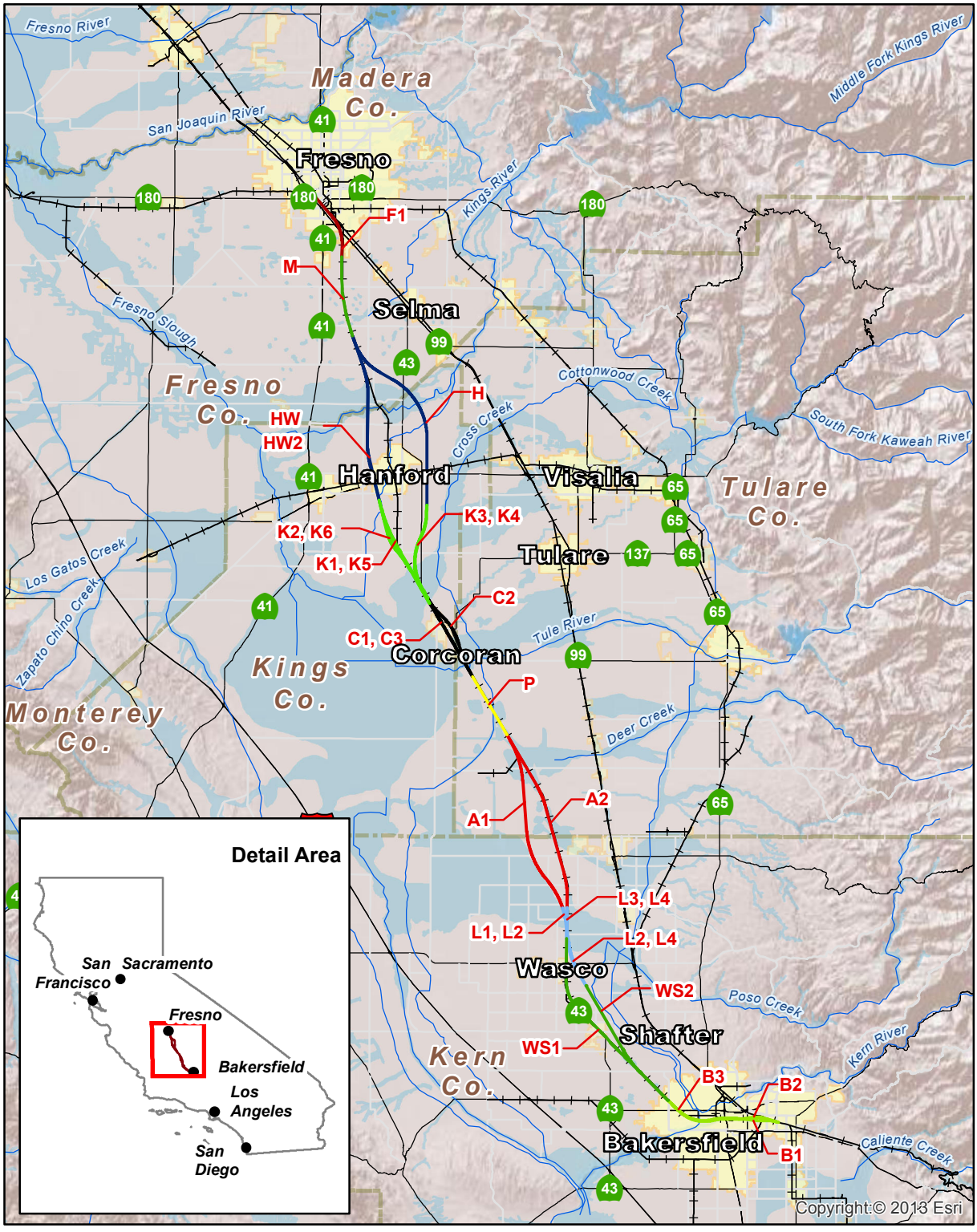

Figure 1.2-1
Alignment Overview

1.3 Purpose

This Stormwater Management Report was prepared for the proposed preliminary design for the segment located between Central Fresno and Oswell Street in Bakersfield. This report provides a high-level plan for managing stormwater between Fresno and Bakersfield at the preliminary design level. The emphasis of the report is management of stormwater associated with the HST; however, it also addresses stormwater considerations for roads and highways that may be altered or relocated to accommodate the HST. Information in this report is preliminary, commensurate with the preliminary design, and will be updated and expanded as design advances. Discussions regarding potential impacts to floodplains are prepared under separate cover titled *Floodplains Impact Report*. Discussions regarding hydraulics and drainage are prepared under separate cover titled *Hydrology, Hydraulics, and Drainage Report*.

1.4 Setting

The area has a typical Mediterranean climate. Summers are long, hot, and dry; winters are cool, moist, and relatively short (United States Army Corps of Engineers [USACE] 1996). Annual rainfall in the area from Fresno to Bakersfield ranges between 5.5 and 10.5 inches (Western Regional Climate Center 2010), with the majority of the precipitation occurring between November and April. Runoff events correspond to rainfall and snowmelt (USACE 1996). Three types of storms produce precipitation in the area: general winter storms, thunderstorms, and tropical cyclones called the "pineapple express." Flooding is most often caused by high intensity rainfall during general winter storms, and severe flooding can result from tropical cyclones.

The Central Valley is fairly level, with slopes commonly less than 1%. Natural vegetation is somewhat sparse; however, most of the land area is dedicated to heavy agricultural production. Due to the generally low rainfall in this portion of the Central Valley, agriculture is heavily dependent on a vast network of irrigation canals that crisscross the valley floor. Both irrigation flows and stormwater are conveyed through the irrigation network, as well as by natural streams.

Land uses near the project include a mixture of agricultural, open space, residential, commercial, industrial, railroad, highway, and flood control uses. Soils in the valley tend to be sands and silty sands.

Future climate change in the Central Valley is a possibility. The California Water Plan notes that climate change has been observed in the average Sierra Nevada snowpack decreasing by approximately 10% during the last century, the sea level rising 7 inches along California's coast, peak natural flows increasing over the last 50 years on many of the state's rivers, and many Southern California cities experiencing their lowest recorded annual precipitation twice within the past decade (California Department of Water Resources [DWR] 2009).

1.4.1 Watersheds

The project is within the Tulare Lake Basin, which has a drainage area of 17,400 square miles (Central Valley Regional Water Quality Control Board [CVRWQCB] 2004). The Tulare Lake Basin is drained by the ephemeral Kings, Kaweah, Tule, and Kern Rivers, which flow to the dry beds of Tulare, Buena Vista, and Kern Lakes. Before agricultural development, the Tulare Lake Basin was dominated by four large, shallow, and mainly temporary inland lakes. The Tulare Lake bed, which was the most northerly lake of the four, has been turned into a system of approximately 103 miles of levees and irrigation canals to direct flooding away from farmed tracts of land (USACE 1996). The Kern River once flowed south and west across the southern portion of the valley through a complex system of sloughs, creeks, ponds, and permanent wetlands, feeding Buena Vista and Kern lakes.

Because of the extensive agriculture diversions, Tulare Lake has been primarily dry since the end of the 19th century — except for a few rare, major flood events whereby the lake temporarily impounds runoff from these watersheds, sometimes with sufficient volume to discharge excess surface water northward into the San Joaquin River (DWR 2009).

The Tulare Lake Basin comprises a portion of RWQCB Central Valley Region 5, including all of Kings and Tulare Counties and portions of Fresno and Kern Counties. Of the 10 subwatersheds in Region 5, the South Valley Floor subwatershed covers most of the section from Fresno to Bakersfield. DWR has defined and numbered surface water hydrologic units (HU) throughout the state to better manage both studies and capital improvements on a watershed and subwatershed basis. The HUs within the Fresno to Bakersfield Section have been defined and numbered by DWR and RWQCB as part of the South Valley Floor subwatershed: 51, 57, and 58 (see Figure 1.4-1).

1.4.1.1 South Valley Floor Subwatershed Hydrologic Unit 51

South Valley Floor Subwatershed HU 51 includes approximately 1,848,000 acres throughout Fresno, Kings, and Tulare Counties. HU 51 is bounded by the San Joaquin River Hydrologic Basin to the north, HU 52 (Kings River HU) and 53 (Kaweah River HU) to the east, HU 58 to the south, and HU 59 (Coast Range HU) to the west. HU 51 includes the City of Fresno.

The San Joaquin and Kings Rivers are the two principal rivers within or bordering the subwatershed. Fresno Slough and James Bypass on the western side of the subwatershed connect the Kings River with the San Joaquin River. The San Joaquin River has continuous flow, while Kings River, Fresno Slough, and James Bypass are ephemeral. Major engineered features include the California Aqueduct.

1.4.1.2 South Valley Floor Subwatershed Hydrologic Unit 57

South Valley Floor Subwatershed HU 57 includes 853,000 acres in Kern County. HU 57 is bounded by HU 58 to the north, HU 56 (Grapevine HU) to the south and east, and RWQCB Region 3 to the west. HU 57 includes the city of Bakersfield. Hydrologic features include Kern River, Lake Webb, and the Pioneer, Buena Vista, Stine, Sunset, and Kern Island Canals. Major engineered features include the California Aqueduct.

1.4.1.3 South Valley Floor Subwatershed Hydrologic Unit 58

South Valley Floor Subwatershed HU 58 includes 2,569,000 acres throughout Fresno, Kings, Tulare, and Kern Counties. HU 58 is bounded by HU 51 and HU 59 to the north, HU 53 and HU 55 (Southern Sierra HU) to the east, HU 57 to the south, and RWQCB Region 3 to the west.

Major rivers and streams in the subwatershed include the Kaweah, Tule, St. Johns, and Kern Rivers, and Cross and Poso Creeks. The west-flowing Tule River, Deer Creek, and the White River are also major drainages in the subwatershed, which discharge into the Tulare lakebed. Deer and Poso Creeks and the Kaweah, St. Johns, Kern, Tule, and White Rivers are ephemeral. Major engineered features include the Friant Kern Canal and the California Aqueduct.

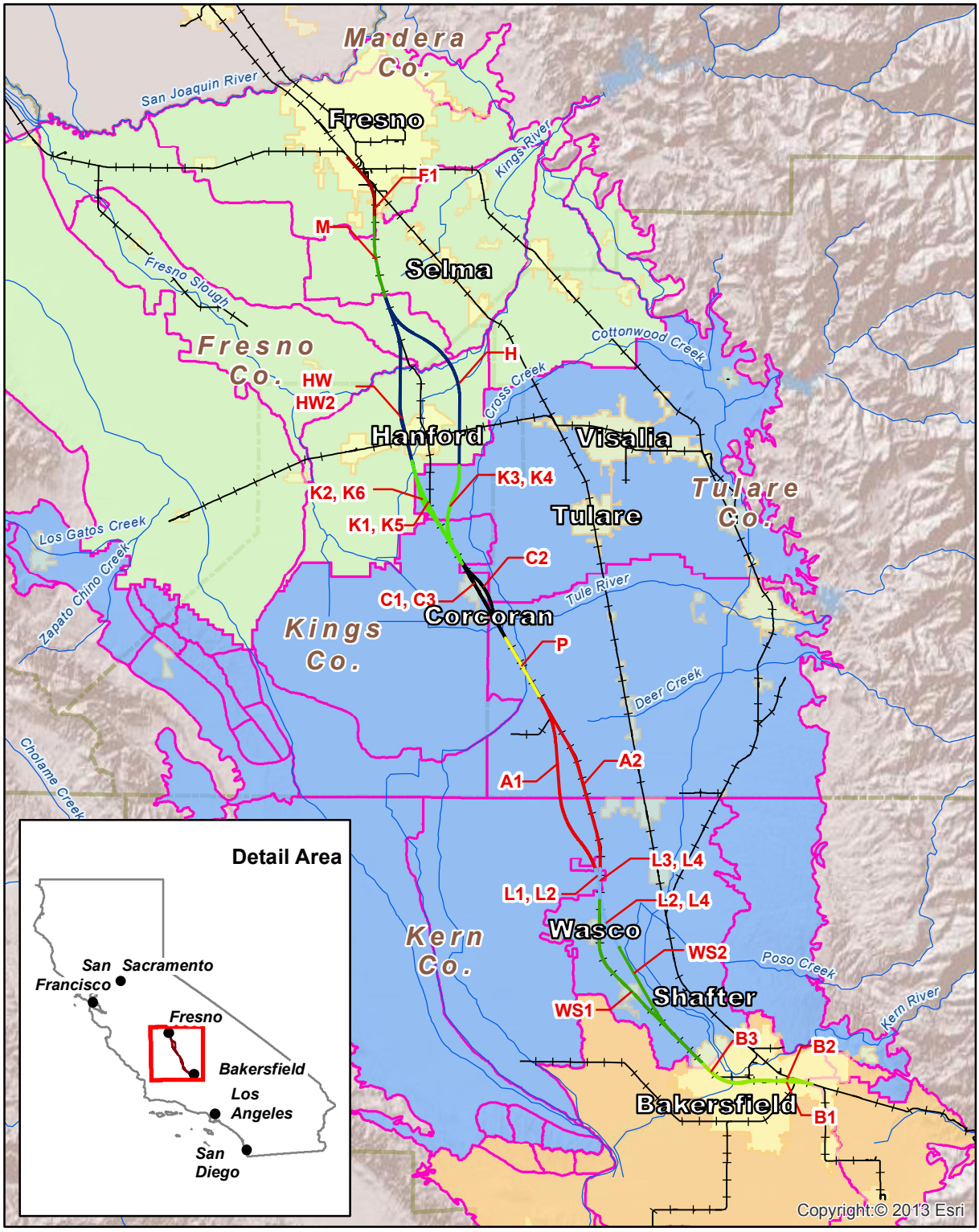

Figure 1.4-1
South Valley Floor Subwatershed Hydrologic Units

1.4.2 Regional Features

1.4.2.1 Local Jurisdictions

The Fresno to Bakersfield Section passes through the following local jurisdictions:

- City of Fresno.
- Fresno County.
- Kings County.
- City of Hanford.
- City of Corcoran.
- Tulare County.
- Kern County.
- City of Wasco.
- City of Shafter.
- City of Bakersfield.

In general, urban areas have existing storm drain facilities that capture and convey surface runoff in the project area. Information on specific local and municipal drainage system design standards for some local jurisdictions is provided below. Additional information will be obtained during later stages of design as local agencies are met with.

County and City of Fresno

The Fresno Metropolitan Flood Control District (FMFCD) provides flood control, urban drainage, and groundwater resource management services within a 400-square-mile watershed located between the Kings River Complex and San Joaquin River. The major FMFCD facilities consist of three reservoirs, five regional flood detention basins, urban basins, and natural and constructed channels (FMFCD 2009). Within Fresno, stormwater runoff is collected in surface drainage structures, pipes, channels, pumps, etc., and transported to basins for storage. Runoff is ultimately either infiltrated or discharged to irrigation channels running through Fresno. The FMFCD owns and operates more than 150 basins in the Fresno area. There are portions of the downtown Fresno area system independent of the FMFCD system and the sole property of the City of Fresno, California Department of Transportation (Caltrans), or private owners, although all discharge to the FMFCD system.

Kings County

The County of Kings, State of California, Improvement Standards (Kings County 2003) should be referenced when detailed drainage design is performed in Kings County.

City of Hanford

The city of Hanford has a stormwater system with over 180 acres of drainage basins. The city also has a new pump station that discharges treated effluent to the Lakeside Ditch Company.

City of Corcoran

In the city of Corcoran, the stormwater system primarily consists of street drainage; however, the system does include lift stations in addition to underground trunk lines for stormwater flows. The system drains to four retention ponds. The system utilizes the Corcoran Irrigation District Canal along Sherman Avenue and Dairy Avenue to carry stormwater flows to the stormwater pond located on Oregon Avenue. The City also utilizes a canal built in 2008 on the west side of the city to convey stormwater flows to a new stormwater pump station on Ottawa Avenue.

Tulare County

Drainage system design for the HST in Tulare County will reference the Improvement Standards of Tulare County (Tulare County 1991).

Kern County

The County of Kern, State of California, Development Standards (Kern County 2010) should be referenced during the detailed design of drainage systems related to the HST in Kern County.

Cities of Wasco and Shafter

The cities of Wasco and Shafter both have stormwater systems. The objectives pertaining to drainage in Shafter, as outlined in the City of Shafter General Plan (City of Shafter 2005a), should be followed during detailed drainage design. Some guidance on drainage design may also be obtained from the City of Shafter Subdivision Engineering and Design Manual (City of Shafter 2005b).

City of Bakersfield

The majority of stormwater runoff in Bakersfield is currently directed to detention basins, with the remainder directed to the Kern River or various canals. Discharges to the Kern River and canals are required to comply with the Tulare Lake Basin Plan.

1.4.2.2 BNSF Railroad

The BNSF railroad consists of 32,000 miles of track spanning the United States and Canada. The BNSF rail line operates year round and transports more than five million shipments annually. The tracks are placed on pervious material (ballast) and elevated approximately 5 feet above grade according to the BNSF Standard Plans (BNSF Railway Company 2007). According to BNSF standards, drainage ditches are located on both sides of the track with a minimum depth of 1 foot and side slopes ranging from 2 horizontal to 1 vertical ratio (2H:1V) to 9H:1V.

Along the BNSF rail line from Fresno to Bakersfield are numerous drainage crossings, including canals that carry irrigation and agricultural drainage, riverine, and cross drainage flows. Larger waterways and canals are typically spanned by bridges or conveyed under the railway by a series of large box culverts. Smaller drainages, minor canals, and cross drainage are conveyed in one or more pipe culverts, which are discussed more detail in the Draft 15% Design Submission Hydrology, Hydraulics, and Drainage Report for this project.

1.4.2.3 Irrigation and Agricultural Drainage Canals

A number of local water supply, flood control, sanitation, and irrigation districts have agricultural water supply, storage, conveyance, and groundwater banking infrastructure that crosses the proposed HST alignments from Fresno to Bakersfield. The districts identified at this time include the following:

Alpaugh Irrigation District
Angiola Water District
Arvin-Edison Water Storage District
Cawelo Water District
City of Corcoran Public Works
City of Fresno Service Area
City of Hanford Public Works
City of Wasco Public Works
Consolidated Irrigation District
Corcoran Irrigation District
Cross Creek Flood Control District
Kern Delta Water District
Kings County Water District
Kings River Conservation District
Laguna Irrigation District
Lakeside Irrigation Water District
Liberty Water District
Lower Tule River Irrigation District
Melga Canal Company
North Kern Water Storage District
North of the River Sanitary District
Pixley Irrigation District

Delano-Earlimart Irrigation District
Fresno Irrigation District
Fresno Metropolitan Flood Control District
JG Boswell Water District
Kaweah Delta Water Conservation District
Kern County Water Agency Improvement District No. 4
Rosedale-Rio Bravo Water Storage District
Semitropic Water Storage District
Shafter-Wasco Irrigation District
Southern San Joaquin Municipal Utility District
Tulare Irrigation District

Within the Fresno-Bakersfield region, canals typically provide irrigation water from riverine diversions during the agricultural planting season and stormwater during the wet season. Such channels often have little to no slope so that water can be moved in either direction. The more significant channels that will intersect the proposed alignments were identified from existing mapping and are listed below:

"A" Ditch
American Colony Canal
Arvin Edison Canal
Bakker Ditch
Blowers Ditch
Calloway Canal
Carrier Canal
Central Canal
Cross Valley Canal
Crosscut Waste
Davis Ditch
East Branch Lakeside Canal
East Branch Peoples Ditch
East Main Last Chance Ditch
East Side Canal
Elkhorn Ditch
Fresno Colony Canal
Friant-Kern Canal
Grant Canal
Hardwick Ditch
Harlan Stevens Ditch
Iowa Ditch
Kern Island Canal
Lakeland Canal
Lakeside Ditch Branches
Liberty Canal
Liberty Ditch
Lone Oak Canal
Melga Canal
Murphy Slough
New Deal Canal
North Central Canal
North Corcoran Ditch
Oleander North Branch Canal
Oleander South Branch Canal
Peoples Ditch
Riverside Ditch
Stine Canal
Sweet Canal
Taylor Canal
Washington Colony Canal
W. Br. Oleander Canal
West Branch Lakeland Canal
West Main Last Chance Ditch
Wristen Ditch/Kirby Ditch

1.4.2.4 Levee Systems

The HST will cross some natural rivers and channels with levee systems.

Three of the levees at the Kings River Complex (Cole Slough/Dutch John Cut/Kings River) are State-Federal Project levees under the jurisdiction of USACE, the Kings River Conservation District, and Central Valley Flood Protection Board (CVFPB). Construction of the HST over these levees will require USACE approval. The CHSTP will aim to avoid impacting the USACE jurisdictional levees at the Kings River Complex.

The levees at Cross Creek within the project area are not USACE jurisdictional levees; however, the levees west of BNSF along Cross Creek and Tule River outside the project area are under USACE's jurisdiction. These levees were constructed in 1983 during an emergency situation to protect Corcoran from Tulare Lake flooding. These levees do not meet Federal Emergency Management Agency (FEMA) certification criteria and were not utilized in the FEMA hydraulic study.

Church Avenue, Central Canal, County Line Creeks, and Poso Creek have no levees. There is a levee along the south side of the Kern River, but it is not under USACE jurisdiction.

1.5 Regulatory Framework

This section outlines the federal, state, and regional agencies and guidelines that may apply to hydrology, hydraulics, and drainage design within the project area.

1.5.1 Federal Guidance

1.5.1.1 National Flood Insurance Act

Title 42 United States Code (U.S.C.) Section 4001 et seq.

The National Flood Insurance Act requires the purchase of insurance for buildings in special flood-hazard areas. The act is applicable to any federally assisted acquisition or construction project in an area identified as having special flood hazards. Projects should avoid construction of buildings in flood-hazard areas identified by the FEMA.

FEMA identifies flood-prone areas, regulates development in floodplains, provides inundation mapping on flood insurance rate maps (FIRMs) as part of the National Flood Insurance Program for each community, and provides federally backed flood insurance to homeowners, renters, and business owners. Typically, each county has a flood insurance study completed and FEMA works with participating communities to develop FIRMs. The FIRMs divide communities into special flood hazard zones and other areas. Special flood hazard zones are areas inundated by a base, 100-year recurrence interval flood (i.e., 1% chance of annual flooding and 26% chance of flooding over a 30-year period). Special flood hazard zones are further classified by the hydraulic analysis approaches and the level of detail used in delineating the base flood boundaries and elevation. Special flood hazard zone classifications are defined in Table 1.5-1.

If a project will substantially alter the extent or depth of the base flood, the project owner must submit supporting documentation and modeling of changed condition. If FEMA approves the development proposal, it issues a Conditional Letter of Map Revision (CLOMR). After construction is complete, as-built construction plans and modeling are submitted to FEMA, and it issues a Letter of Map Revision (LOMR), which officially updates the FIRM.

Within the Fresno to Bakersfield Section, FEMA has conducted detailed flooding studies for Cross Creek, Kern River, and one area within the City of Fresno (Church Street, designated as "Zone AH").

Other delineated floodplain areas for this section include the Kings River Complex, Tule River, Deer Creek, two unnamed watercourses at the Tulare-Kern County border (referred to in this report as County Line Creeks), and Poso Creek. These flood-prone areas are generally designated "Zone A" by FEMA, indicating a floodplain for which FEMA has determined approximate inundation areas but without detailed flow or water surface elevation information.

Table 1.5-1
Special Flood Hazard Zones

Zone	Description
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations (BFEs) are shown within these zones.
AE	Areas with 1% annual chance of flooding. The base floodplain where FEMA BFEs are provided. AE zones are now used on new format FIRMs instead of A1–A30 zones.
A1 through A30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. BFEs derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas and areas with a 1% or greater chance of shallow

Zone	Description
	flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements apply, but rates do not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding that will be protected by a federal flood control system under construction, where construction has reached specified legal requirements. No depths or BFEs are shown within these zones.
A1 through A30[1]	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE.
[1] Floodplain Zone Designation in old FEMA format	

1.5.1.2 Rivers and Harbors Act

Protection of Improvements to Navigable Waters
Title 33 U.S.C. Section 403 et seq.

Section 403 of the Rivers and Harbors Act (commonly known as Section 10), administered by the USACE, requires permits for all structures such as pilings, docks, or bridges that are constructed in navigable waters of the United States. Excavation or fill activities such as dredging and placement of fill or riprap in the waterways also requires permits. Navigable waters include waters that are subject to the ebb and flow of the tide and rivers used as a means of interstate transport or foreign commerce. USACE grants or denies permits based on the impacts on navigation. Under this definition, the Fresno to Bakersfield Section of HST will not impact navigable waters of the United States. Section 404 of the Clean Water Act (CWA) also covers most of these activities.

Use of Harbor or River Improvements
Title 33 U.S.C. Section 408

Modification of a federal flood control project requires permission by USACE through a Title 33 U.S.C. Section 408 permit. Section 408 specifies the technical and risk analyses that must be submitted to USACE by any nonfederal sponsor of a project that may adversely affect the capacity or structural integrity of a federal flood control facility. The types of information required include detailed structural information, hydraulic data (e.g., water surface profiles), and geotechnical evaluations (e.g., levee seepage and stability). A memorandum, Clarification Guidance on the Policy and Procedural Guidance for the Approval of Modifications and Alterations of Corps of Engineers Projects (USACE 2008), provides detailed information.

A Congressional Briefing Paper (California Water Commission 2011), Proposed Framework for Guidance Clarifying the U.S. Army Corps of Engineers Section 408 Review Process for Local Funded and Constructed Improvements to Federal Flood Control Projects, uses the terms "Major 408" and "Minor 408":

- Minor 408s are activities that (i) were previously approved in accordance with Section 208.10 or (ii) go further than simple operations and maintenance, and restore "the authorized level of protection or improve the structural integrity of the protection system that do not change the authorized structural geometry or hydraulic capacity that were previously approved in accordance with Section 208.10."
- Major 408s include all degradations, raisings, realignments, and other alteration/modifications not approvable as a Minor 408.

CHSTP improvements will be designed to avoid the need for a Major Section 408 permit.

In January 2013, USACE released a revised general guidance, Minor Section 408 Modification Guidance (USACE 2013). This guidance provides Minor Section 408 submittal requirements for engineering, operation, and maintenance aspects of construction within the critical area of Flood Risk Reduction Project (FRRP) constructed by USACE and those FRRP in the USACE Public Law 84-99 Rehabilitation and Inspection Program. Where construction is concerned, the critical area for a levee is generally defined as 300 feet riverward to 500 feet landward of the levee's centerline. The review schedule for a Minor Section 408 is six to eight weeks. Local sponsors are the owners of the FRRP and are responsible for controlling all construction activity that occurs within the critical area. No reviews will proceed without permission of the local sponsor.

Local Flood Protection Works
Title 33 Code of Federal Regulations (C.F.R.) Section 208.10

Section 208.10 defines the responsibilities of the USACE for maintenance of flood channels, levees, and other flood protection features constructed by the federal government. USACE approval may be granted under Section 208.10 for alternations or improvements that have little or no impact on the authorized level of protection (capacity) and structural integrity of a federal flood protection project.

The CVFPB, which is part of the California DWR (formerly the California Reclamation Board), administers Section 208.10 in the Central Valley. CVFPB administers permits for encroachments on state and state/federal flood control projects. USACE provides a concurrent review of the technical aspects of encroachment permit applications and provides to CVFPB a list of technical requirements to satisfy USACE responsibilities under Section 208.10.

Since 2006 USACE has considered some modifications and alterations to USACE projects directly under Section 408. From June 18, 2010, Section 408 became the sole authority utilized for approvals to modify USACE projects, and the USACE Districts are authorized to approve pursuant to Section 408 those minor, low-impact modifications to flood protection works operated and maintained by non-federal sponsors that previously were being considered under 33 C.F.R. 208.10(a)(5).

1.5.1.3 Clean Water Act (Title 33 U.S.C. Section 1251 et seq.)

Permit for Fill Material in Waters and Wetlands
Title 33 U.S.C. Section 404

Section 404 of the CWA regulates the discharge of dredged and fill materials into waters of the United States, which include oceans, bays, rivers, streams, lakes, ponds, and wetlands. Emphasis is placed on protection of water quality and conservation of marine and aquatic habitat. It should be noted that under Section 404 of the CWA, the term "navigable waters" includes not only those waters identified as navigable waters of the United States by Section 10 (Rivers and Harbors Act), but also waters with "a significant nexus to navigable waters."

Projects are encouraged to avoid impacts on water bodies or to minimize impacts where a water body cannot be avoided. Projects mitigate for lost habitat, typically by providing replacement habitat at a different location. A 404 permit application must be submitted to USACE. Nationwide 404 permits exist for a large number of activities that have been determined to cause generally minor impacts. A single application typically covers the requirements of both Section 10 and Section 404 (CWA).

Clean Water Quality Certification
Title 33 U.S.C. Section 401

Under Section 401 of CWA, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate, or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all

projects that have a federal component and may affect the quality of state waters (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401. Section 401 certification or waiver is under the jurisdiction of the applicable RWQCB.

National Pollutant Discharge Elimination System
Title 33 U.S.C. Section 402

The CWA requires a National Pollutant Discharge Elimination System (NPDES) permit to be obtained by anyone wanting to discharge pollutants. Section 402 allows the US Environmental Protection Agency (EPA) to authorize the NPDES Permit Program to state governments, enabling states to perform many of the permitting, administrative, and enforcement aspects of the NPDES Program, while still allowing the EPA to retain oversight responsibilities.

In California, the water quality regulations under the CWA have been delegated by the EPA to the State Water Resources Control Board (SWRCB) of California and the various Regional Water Control Boards.

Section 303(d) List of Water Quality Limited Segments

The CWA requires states to identify and make a list of surface water bodies that are polluted. These water bodies do not meet water quality standards even after discharges of waste from point sources have been treated by the minimum required levels of pollution control technology. States must also prioritize the water bodies on the list and develop total maximum daily loads (TMDLs) to improve the water quality. The project-specific 303(d)-listed water bodies are discussed in Section 1.5.3.

1.5.1.4 Executive Order 11988

Executive Order 11988 directs all federal agencies to (1) avoid to the extent practicable and feasible all short-term and long-term adverse impacts associated with floodplain modification and (2) avoid direct and indirect support of development within 100-year floodplains when there is a reasonable alternative. Additional specific information must support projects that encroach on 100-year floodplains.

1.5.1.5 Floodplain Management (U.S. Department of Transportation Order 5650.2)

The U.S. Department of Transportation Order 5650.2, Floodplain Management and Protection, prescribes "policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs and budget requests." The order applies to all floodplains as shown on FEMA FIRMs with the exception of Zone C (areas of minimal flooding). Environmental review documents should indicate potential risks and impacts from proposed transportation facilities.

1.5.1.6 Federal Highway Administration

The Federal Highway Administration (FHWA) requires a floodplain report (location hydraulic study) when a proposed transportation project may encroach on a FEMA-established (100-year) flood hazard area. A similar approach to risk assessment and reporting is proposed for the HST. The minimum required content of the floodplain report must be as prescribed in Title 23 C.F.R. Section 650, as follows:

- The degree of encroachment associated with each alternative, including evaluation and discussion of the practicability of alternatives to any encroachments.
- The risks associated with implementation of the action, including potential for interruption or termination of communities, only evacuation routes, or facilities needed for emergency vehicle and the significant potential for flood-related property loss or hazard to human life.
- The impacts on natural and beneficial floodplain values.
- The support of probable incompatible floodplain development.

- The measures to minimize floodplain impacts associated with the action.
- The measures to restore and preserve the natural and beneficial floodplain values impacted by the action.
- Evaluation and discussion of the practicability of alternatives to any significant encroachments or any support of incompatible floodplain development.

The floodplain report must also discuss the mitigation measures to minimize floodplain impacts and to restore and preserve the natural and beneficial floodplain values that are impacted. This analysis will be completed during later stages of design if necessary.

Additionally, FHWA has developed numerous design manuals. Many FHWA design manuals are referenced in the Caltrans Highway Design Manual (HDM) (Caltrans 2011), and many FHWA standards have been adopted by Caltrans. Unless otherwise noted, the CHSTP has adopted Caltrans standards for hydrologic analysis and hydraulics design. Design manuals referenced for this report include the *Design of Roadside Channels with Flexible Linings Hydraulic Engineering Circular (HEC) 15* (FHWA 1988), *Urban Drainage Design Manual HEC 22* (FHWA 2001), and *Design of Bridge Deck Drainage HEC 21* (FHWA 1993).

1.5.2 State Regulations and Guidelines

1.5.2.1 Porter-Cologne Water Quality Act

California Water Code 13000 et seq.

Water quality law in California is governed by the Porter-Cologne Water Quality Act. Primarily the act assigns responsibility for water rights and water quality protection to the SWRCB and directs nine RWQCBs to develop and enforce water quality standards including responsibility for issuance of NPDES permits.

1.5.2.2 State Water Resources Control Board

The SWRCB has adopted water quality standards for the state's waters and issues permits regulating the discharge of wastes into these waters. Permits can be issued by the SWRCB or by the RWQCBs under the jurisdiction of the state board. Details of some of the discharge permits administered by the SWRCB are provided below.

Construction General Permit

On July 1, 2010, the revised General Construction Stormwater Permit took effect, issued by the SWRCB. The requirements for this permit apply to any project that disturbs 1 acre or more of land. For a project to qualify under the general permit, a Notice of Intent (NOI) must be filed with the SWRCB and a Stormwater Pollution Prevention Plan (SWPPP) must be prepared that details the erosion and sediment control measures and other pollution prevention measures that will be implemented at the project site. The SWPPP must also contain a runoff monitoring plan and measures for inspecting, maintaining, and upgrading, as necessary, the erosion control measures.

The General Construction Stormwater Permit deals with stormwater runoff leaving the project site and may also cover dewatering activities, although the individual RWQCB may have special dewatering requirements. Additional specific requirements are applied depending upon the location of a project and its perceived risk level (see section 2.3 for a discussion on project-specific risk assessment).

Dewatering and Other Low-Threat Discharges to Surface Waters

This General Order covers certain categories of dewatering and other low-threat discharges to waters of the United States, which are either four months or less in duration or have an average dry weather flow

that does not exceed 0.25 million gallons per day (from Permit Number R5-2008-0081). The General Permit specifies both effluent limitations and receiving water limitations. Additional details about the permit are available at the SWRCB website: http://www.swrcb.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2008-0081.pdf.

Municipal Separate Storm Sewer Systems

A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances that meets the following:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the United States.
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.).
- Not a combined sewer.
- Not part of a publicly owned treatment works (sewage treatment plant).

Phase I, issued in 1990, required medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. Phase II, issued in 1999, required regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. Generally, Phase I MS4s are covered by individual permits and Phase II MS4s are covered by a General Permit. Each regulated MS4 is required to develop and implement a stormwater management program to reduce contamination of stormwater runoff and prohibit illicit discharges.

Both Fresno and Bakersfield have Phase 1 MS4 NPDES permits in place, and therefore, consultation will be required in these municipalities.

1.5.2.3 California Department of Fish and Game

Lake or Streambed Alteration Agreement
California Code of Regulations Sections 1601–1603

The California Department of Fish and Game (CDFG) is responsible for, among other things, preserving and protecting aquatic and marine habitats. Under Sections 1601–1603 of the California Code of Regulations (CCR), agencies are required to notify CDFG prior to implementing a project that would substantially divert, obstruct, or change the natural flow of any river, stream, or lake. The project must submit a Notification of Lake or Streambed Alteration and notify CDFG about any action that would substantially alter the channel or streambed or deposit material within the channel. If CDFG determines that the project may adversely affect an existing fish and wildlife resource, it will issue a Lake or Streambed Alteration Agreement that lists measures that must be completed to adequately protect the resource.

1.5.2.4 California Department of Transportation

Caltrans is not a direct reviewing agency for the CHSTP; however, it has regulatory authority over those portions of the project that involve modifications to state highways. The High-Speed Rail Authority (Authority) has generally agreed to comply with Caltrans's requirements and templates, when practical. Caltrans HDM (Caltrans 2011) contains detailed information for the design of highway and road stormwater systems. For those portions of the CHSTP that involve altering or relocating state highways, the drainage design will need to follow Caltrans HDM.

Location Hydraulic Studies

Chapter 804 of the HDM (Caltrans 2009) addresses the topic of floodplains; Section 804.7.2.e states that the results of location hydraulic studies must be summarized in the environmental document prepared for the project. A location hydraulic study is the preliminary investigation of the degree of floodplain encroachment by a project (Caltrans 2009). The study must address the following:

- Flood risks associated with the project.
- Impacts on natural and beneficial floodplain values.
- Identification of probable incompatible floodplain development.
- Measures to minimize floodplain impacts.
- Measures to restore and preserve the natural and beneficial values affected by the project.
- Evaluation of the practicality of alternatives to significant floodplain encroachment.

A significant floodplain encroachment is determined by one or more of the following:

- A significant potential for interruption or termination of a transportation facility that is an emergency vehicle route or a community's only evacuation route.
- A significant risk to life or property.
- A significant adverse impact on the natural and beneficial floodplain values.

Section 804.7 of the HDM states that the location hydraulic studies can be documented in a floodplain evaluation report attached to the project's environmental documentation. The timing of location hydraulic studies may depend in part on whether a state highway is being modified under Caltrans jurisdiction. Caltrans is not a direct reviewing agency for this project; however, the Authority has generally agreed to comply with Caltrans requirements and templates when practical.

Location hydraulic studies must be performed for each of the major floodplains identified in Table 2.1-1 of the Draft 15% Design Submission Floodplain Impact Report (URS/HMM/Arup Joint Venture 2013). The level of detail for these studies is comparable to the analysis required for development permits and should be summarized in a floodplain evaluation report appended to the final Environmental Impact Report/Statement. The following should be determined and developed for all relevant water bodies along the alignment:

- WSE based on the 100-year design flow (or 200-year design flow).
- Map illustrating the FEMA 100-year flood limits (or DWR 200-year floodplain limits) and portions of the project and existing buildings situated within the floodplain.
- Completion of Forms 804.7A (Technical Information for Location Hydraulic Study) and 804.7B (Floodplain Evaluation Report Summary) for projects identified to have minor floodplain impacts (Section 804 of the HDM [Caltrans 2009]).

1.5.3 Regional Regulations

1.5.3.1 Central Valley Regional Water Quality Control Board

For the Fresno to Bakersfield Section, the RWQCB for the Central Valley Region, also known as Region 5, is the primary regulatory agency that will oversee conformance of the project's stormwater quality management system with the Clean Water Act. The California Water Code established the RWQCBs as the primary state agencies for protecting the quality of waters. The RWQCB developed a Tulare Lake Basin Plan, which outlines beneficial uses of water bodies as well as specific water quality objectives for surface and ground waters. The water quality objectives include concentration limits for a large range of pollutants. Regulations for discharges within this area are included in the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (California RWQCB Central Valley Region 2009).

Impaired Water Bodies and Total Maximum Daily Loads

The Fresno to Bakersfield Section drains to several water bodies listed on the 2006 State 303(d) List of Impaired Water Bodies for exotic species, selenium, electrical conductivity, molybdenum, and toxaphene. Table 1.5-2 lists details for each impaired water body within the project area. The listings carry the implication that the receiving waters have exceeded the maximum load of pollutants they can receive while still meeting water quality standards. These maximum amounts are termed TMDLs. The Federal Clean Water Act requires that programs to reduce pollutant loading be implemented for all water bodies listed on the State 303(d) list. These programs are also termed TMDLs.

Table 1.5-2
Clean Water Act Section 303(d): Listed Water Bodies and Priority Pollutants in the Project Vicinity

Name	Pollutant	Source	Status
San Joaquin River (Friant Dam to Mendota Pool) Exotic Species	Exotic species	Source unknown	TMDL required
Mendota Pool	Selenium	Agricultural return flows, agriculture, groundwater withdrawal, other	TMDL required
Kings River, Lower (Island Weir to Stinson and Empire Weirs)	Electrical conductivity	Agriculture	TMDL required
Kings River, Lower (Island Weir to Stinson and Empire Weirs)	Molybdenum	Agriculture	TMDL required
Kings River, Lower (Island Weir to Stinson and Empire Weirs)	Toxaphene	Agriculture	TMDL required
Kings River, Lower (Pine Flat Reservoir to Island Weir)	Chlorpyrifos Unknown Toxicity	Agriculture Source Unknown	TMDL required
Cross Creek (Kings and Tulare Counties)	Unknown Toxicity	Source Unknown	TMDL required
Deer Creek (Tulare County)	pH (high), Unknown Toxicity	Source Unknown	TMDL required

The proposed project is not expected to contribute to exotic species, selenium, molybdenum, and toxaphene. However, heavy metals generated by the rail can potentially affect electrical conductivity.

Tulare Lake Basin Plan

Any project stormwater management plan will need to meet the requirements of the Tulare Lake Basin Plan (California RWQCB Central Valley Region 2009), which provides information on the beneficial uses and TMDLs of the receiving water bodies. Table 1.5-3 lists specific beneficial uses for each water body. Groundwater beneficial uses are organized by detailed analysis units based on the water bodies. Surface water beneficial uses are organized by segments of the relevant water bodies.

1.5.3.2 Central Valley Flood Protection Board

California Code of Regulations Title 23, Division 1

In cooperation with USACE, the CVFPB provides policy direction and coordination for the flood control efforts of state and local agencies along the Sacramento and San Joaquin Rivers and their tributaries. CVFPB cooperates with federal, state, and local government agencies in establishing, planning, constructing, operating, and maintaining flood control works. Additionally, under Section 8609 of the California Water Code, CVFPB has the authority to designate floodways, enforce standards for the

construction, maintenance, and protection of adopted flood control plans, and regulate encroachments in a floodway. By issuing permits for encroachments, CVFPB also exercises regulatory authority to maintain the integrity of the existing flood control system and designated floodways.

CVFPB has mapped designated floodways along more than 60 streams and rivers in the Central Valley. CVFPB-designated floodways are different from FEMA floodways. Designated floodways refer to the channel of the stream and that portion of the adjoining floodplain reasonably required to provide the passage of a design flood (generally the 100-year storm event); it is also the floodway between existing levees as adopted by CVFPB or the California legislature.

In addition to designated floodways, Table 8.1 in Title 23 CCR lists several hundred stream reaches and waterways as regulated streams. Projects that would encroach on a designated floodway or regulated stream, or come within 10 feet of the toe of a state/federal flood control structure (e.g., a levee), require an application (with an associated environmental assessment questionnaire) for an encroachment permit. The Kings River Complex, Cross Creek, and the Kern River are listed in Table 8.1 and are therefore under CVFPB's purview.

CVFPB reviews encroachment permit applications for completeness and works with the applicant to ensure that all required content is submitted. CVFPB provides a copy of the application to USACE for concurrent review. In general, USACE focuses on technical engineering requirements, such as hydraulic modeling, geotechnical studies, and performance requirements to fulfill its obligations under Section 408 and Section 208.10; CVFPB focuses on environmental compliance and Title 23 standards to ensure compliance under the California Environmental Quality Act and Title 23. USACE develops a list of requirements and restrictions (e.g., maximum rise criteria demonstrated through hydraulic modeling), which append the permit. CVFPB may also develop a list of requirements and restrictions for the permit and either issue the permit with requirements and restrictions or deny the permit based on their collaborative review with USACE.

Table 1.5-3
Water Body Beneficial Uses

Water Body[1] (Name)	Tulare Lake Basin Plan Beneficial Uses[2]														303(d) Listed Pollutants
	MUN	AGR	IND	PRO	POW	REC-1	REC-2	WARM	COLD	WILD	RARE	SPAWN	GWR	FRSH	
Kings River (Peoples Weir to Stinson Weir on North Fork and to Empire Weir No. 2 on South Fork)		X				X	X	X		X			X		Electrical conductivity, molybdenum, toxaphene[3]
Cross Creek[4] (Kaweah River, Below Lake Kaweah)	X	X	X	X		X	X	X		X			X		
Tule River (Below Lake Success)	X	X	X	X		X	X	X		X			X		
Poso Creek		X				X	X	X	X	X			X	X	
Kern River (Below KR-1)	X	X	X	X	X	X	X	X		X	X		X		

Notes:
[1] Features identified from review of United States Geological Survey topographic maps and aerial photographs.
[2] Surface water beneficial uses identified in the Tulare Lake Basin Plan (Central Valley RWQCB 2004).

MUN = municipal and domestic water supply
AGR = agricultural supply
IND = industrial service supply
PRO = industrial process supply
POW = hydropower generation
REC-1 = water contact recreation
REC-2 = non-contact water recreation
WARM = warm freshwater habitat
COLD = cold freshwater habitat
WILD = wildlife habitat
RARE = rare, threatened, or endangered species
SPWN = spawning, reproduction, and/or early development
GWR = groundwater recharge
FRSH = freshwater replenishment

Water Body[1] (Name)	Tulare Lake Basin Plan Beneficial Uses[2]														303(d) Listed Pollutants
	MUN	AGR	IND	PRO	POW	REC-1	REC-2	WARM	COLD	WILD	RARE	SPAWN	GWR	FRSH	
[3] Kings River is impaired approximately 10 miles downstream of study area (from Island Weir to Stinson and Empire Weirs). After extended wet periods, Kings River conveys water to Mendota Pool and San Joaquin River (from Friant Dam to Mendota Pool), approximately 55 miles downstream of the study area. [4] Lake Kaweah, which provides flow to the Kaweah River and Cross Creek, is impaired approximately 50 miles upstream of study area.															

1.5.3.3 Central Valley Flood Protection Act

California Water Code 9600 et seq.

DWR and CVFPB (which is part of DWR) collaborated with local governments and planning agencies, prepared and adopted the Central Valley Flood Protection Plan (CVFPP) in mid-2012. The CVFPP is a requirement of the Central Valley Flood Protection Act of 2008, which establishes the 200-year flood event as the minimum level of flood protection in urban and urbanizing areas. The objective of CVFPP is to create a system-wide approach to flood management and protection improvements in the Central Valley.

Cities and counties must amend their general plans accordingly within 24 months of the CVFPP adoption; zoning ordinances must be amended within 36 months. Consequently, the 200-year flood event must be incorporated into city and county design standards by January 1, 2015, for new residential and nonresidential construction within flood hazard zones. By 2025, all urban areas protected by flood-control project levees must be protected from a 200-year flood event.

Under its FloodSAFE program, DWR is responsible for developing and making available maps for the 200-year floodplain (DWR 2008c). CVFPB collaborates with cities and counties to develop policies for implementing amended general plans.

1.5.4 Local Regulations

The cities and counties within the study area have regulations and manuals governing stormwater management for projects constructed within their respective jurisdictions. No contacts were made with local jurisdictions during the development of this Stormwater Quality Management Report. Stormwater requirements have changed significantly at the state level, and it is expected that the requirements of the local jurisdictions will need to be modified in the near future to comply with state requirements. It is recommended that public works department officials from each of the jurisdictions be contacted and interviewed for the purpose of acquiring up-to-date information on local stormwater regulations and manuals.

1.6 Other Standards

1.6.1 American Railway Engineering and Maintenance-of-Way Association

The American Railway Engineering and Maintenance-of-Way Association (AREMA) publishes standards and best practices for railway engineering. The *Manual for Railway Engineering* is an annual publication released by AREMA. It contains principles, data, specifications, plans, and economics pertaining to the engineering, design, and construction of the fixed plant of railways (except signals and communications) and allied services and facilities. Portions of Volume One of the AREMA manual pertain to drainage standards.

This page intentionally left blank.

Section 2.0

Stormwater Management

2.0 Stormwater Management

This section describes the guidelines and criteria for integrating stormwater best management practices (BMPs) into the project drainage system for the Fresno to Bakersfield Section. These BMPs serve to mitigate adverse effects this project may have on stormwater quality. BMPs will be selected based on site-specific conditions, the overall management objectives of the watershed, and NPDES requirements.

2.1 Overall Concept

Major drainage design concepts for the CHSTP are described in this section. Where feasible and practical, the drainage design will do the following:

- Maintain existing drainage flow patterns.
- Disperse onsite runoff to encourage local infiltration.
- Incorporate existing drainage systems.
- Improve existing drainage capacity if the CHSTP exacerbates existing drainage problems or flooding at a location where the existing system is known to be undersized.
- Treat runoff from pollution-generating impervious surfaces to the maximum extent practicable to meet water quality objectives and water quality standards set forth by the Central Valley RWQCB before discharging to receiving waters.

For a considerable portion of the Fresno to Bakersfield Section project area the HST runs parallel to the existing BNSF Railway. The HST will not introduce new types of pollutants to the Tulare Lake Basin; however, the presence of the new HST could increase the amount of the pollutants that may already exist in the watershed by increasing rail service.

However, the technology proposed for the HST system does not require large amounts of lubricants or hazardous materials for operation. The electric trains will use a regenerative braking technology, resulting in reduced physical braking and associated wear. Runoff from the at-grade tracks and the elevated guideways will have minimal pollutants.

Contributing pollutants that are listed on a 303(d) list (see Table 1.5-2) or for which a TMDL has been developed could be considered as substantially degrading water quality. TMDLs have not been identified for most of the surface water bodies in the vicinity of the Fresno to Bakersfield segment of the HST.

With respect to the pollutants listed on the 303(d) list, the project will not contribute toxaphene — a pesticide that is currently banned in the United States and whose use has been severely restricted since the 1980s — nor will it contribute chlorpyrifos, a more recently developed pesticide. The existing molybdenum problem is likely from natural sources or fertilizers. Molybdenum is used as an alloy with steel to increase strength and heat resistance, and sometimes used in lubricants, so it may exist in the materials used to construct and operate the HST. However, molybdenum will not be in a form or quantity that will contribute to water quality degradation. Electrical conductivity is a surrogate for dissolved solids, and the operation of the HST will not contribute any dissolved solids to receiving waters and therefore not contribute to conductivity in the Kings River. In addition to the low amount of pollutants that will be available to be contributed by the HST to receiving waters, the runoff from the HST will primarily be collected in swales and infiltration/detention ponds, and thus will contribute only a minor volume of flow to the receiving waters during storm events.

During project operations, stormwater runoff from station parking lots, the heavy maintenance facility, and railroad rights-of-way will be directed as sheet flow into the adjacent drainage systems, or directed through swales to infiltration basins. The basins will be designed as a water quality control measure. No runoff from the project will be discharged directly to any surface water bodies, irrigation canals, private property, or county roads. Runoff from bridges, overpasses, underpasses, and aerial structures will be collected and discharged to BMPs within the project area or adjacent storm drainage systems, such as that managed by FMFCD for the portion of the project in Fresno County.

Design frequencies will be as specified in Table 3-1 of California High-Speed Rail Design Guidelines (Hydraulics and Hydrology Design Guidelines 2010). Information regarding annual precipitation, daytime temperatures and potential evaporation can be found in the HST Draft Water Quality Hydrology Technical Report (WQHTR, April 2010) or on the National Oceanic and Atmospheric Administration's Hydrometeorological Design Studies Center website, or obtained from the California Department of Water Resources (CDWR).

2.1.1 Proposed Onsite Drainage Conditions

At-Grade Track Segments: Rainfall will flow laterally out from the track into flat-bottom drainage ditches within the right-of-way. Emphasis will be placed upon onsite retention of runoff by using low-impact development measures. If the soils in the adjacent right-of-way are Hydrologic Soil Group (HSG) A or B soils, the runoff will likely infiltrate within the ditches. For soils with a low infiltration rate (HSG C and D), compost-amended soils will be used in the ditches to encourage infiltration and reduce or eliminate runoff. The onsite ditches and retention basins will be designed to accommodate the 25-year design storm event for rural areas and 50-year design storm event for urban areas. For highly developed urban areas, areas with poorly draining soils, and known drainage problem areas, conventional stormwater ditches leading to established discharge locations will likely be required. The outfall location of the onsite ditches should be designed not to change the historical drainage pattern for storm runoffs larger than the design storm.

Elevated Track Segments: The elevated track will be supported by slabs or ballast on slabs, beams, and columns constructed from reinforced concrete and steel. Where the elevated guideway crosses unpaved ground, runoff from the impervious track supports could be dispersed to infiltration swales or other BMPs beneath the track for infiltration. Raised curbs at the outer edges of the guideway could be used to collect runoff where it can be conveyed to the infiltration swales or other BMPs at each column for retention and infiltration. This approach will largely eliminate the need for offsite ditches or pipes to convey local runoff, encouraging local retention instead. A program of adaptive monitoring of local drainage conditions should be carried out for several years following construction in order to identify and correct any residual drainage problems that might develop along the HST right-of-way.

Where the elevated guideway passes over developed urban corridors with existing impervious surfaces, rainwater will be collected via inlets and conveyed down support columns to the existing storm drainage system. An analysis of the receiving drainage system must be carried out to assure there is adequate capacity. Within Fresno, drainage from the viaducts can be discharged directly to the FMFCD drainage system — no individual HST BMPs are required because water quality treatment is carried by FMFCD in its system. Where sufficient capacity to accommodate project runoff is found to be lacking, additional capacity will need to be added. Alternatively, onsite retention/detention could be pursued if adequate right-of-way exists.

Passenger Stations: Passenger stations will include significant impermeable surfaces in the forms of roofs, platforms, ramps, stairs, buildings, parking areas, and other hard structures. Some or all of these may be classified as pollutant-generating surfaces, requiring water quality BMPs and quantity detention prior to release to existing stormwater systems. As design progresses, the new stormwater system may include such features as inlets, grated catch basins, storm drains, flow splitters, detention/infiltration basins, and energy dissipaters. It may also include treatment BMPs and low-impact design approaches such as dispersal, infiltration trenches, filter strips, biofiltration swales, and permeable pavement.

Heavy Maintenance Facilities: An HMF will cover a large area, most of which will consist of impermeable surfaces that will produce large amounts of runoff. Several large parking areas plus several outdoor maintenance activities will produce polluted runoff that will require water quality treatment. An extensive system of pipes and ditches will be required to route the HMF runoff to treatment BMPs (where required) and to one or more stormwater holding areas.

If soil conditions are found to be supportive, all or most of the stormwater may be infiltrated onsite. If this is the case, the water quality treatment requirements may be greatly reduced to perhaps oil/water separation and emergency containment provision for high-use areas. If onsite infiltration cannot be accomplished, then stormwater detention must be provided. Several of the sites have very little topographic relief. As a result, stormwater pumping could be required.

The HST's HMFs are potentially subject to permitting under the SWRCB General Permit No. CAS000001 (industrial activities), as a transportation facility that conducts vehicle maintenance. Coverage under this permit will require preparation of a site-specific SWPPP and annual monitoring and reporting. However, such facilities that do not discharge to surface waters are not required to be permitted. As addressed earlier, the design intent is to minimize runoff and direct all runoff into onsite retention basins for evaporation and infiltration. Additional permit information can be found on the SWRCB website: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/induspmt.pdf

Modified Intersections: There will be no at-grade crossings of the HST tracks. Selected roadway crossings will be modified where the HST is at grade or in spatial conflict with existing overpasses. Runoff from the new and replaced roadway pavement will require stormwater treatment and, in some cases, flow attenuation to meet current stormwater management requirements. Local flow paths and discharge points will not be modified substantially. Discharges from Caltrans right-of-way will be subject to Caltrans NPDES requirements.

Trenches and Cuttings: At most locations where the track is in a cut runoff that generated within the right of way will be collected in flat bottomed swales within the cut, similar to the system used in the at-grade track segments. Where the track is in a narrow retained cut of significant length a retention basin is provided adjacent to the cut. Water in the cutting will be collected in drains and pumped up to the retention basin.

2.1.2 Offsite Runoff

Existing Offsite Drainage Conditions: Offsite drainage consists of overland sheet flow and concentrated flow in swales and ditches, irrigation ditches and canals (many confined by elevated embankments/levees), and natural channels (some of which include levees, embankments, or diversions).

Proposed Offsite Drainage Condition: Runoff generated up gradient (uphill) of the HST alignment will be collected outside the HST right-of-way and conveyed via a pipe culvert to cross the sections of the HST that are on embankment, or retained fill. Specific design requirements for water body crossings are provided in the Hydraulics and Floodplain Technical Report (Authority and FRA 2011a). Also, the Authority has agreed to follow the Caltrans HDM, with few exceptions, and has summarized design guidelines in Technical Memorandum 2.6.5 Hydraulics and Hydrology Design Guidelines (Parsons-Brinckerhoff 2010).

2.2 Best Management Practices

BMPs can be utilized during different phases of the project. During construction, BMPs can be used to mitigate construction activities contributing to stormwater pollution. BMPs can also remove pollutants resulting from the operation and maintenance of a new project. BMPs for all categories are described briefly in Appendices A1, A2, and A3, with additional details available in the *California Stormwater BMP Handbook for Construction* (California Stormwater Quality Association [CASQA] 2003a).

2.2.1 Construction Considerations

The construction site will be subject to the statewide NPDES general permit for construction activities, SWRCB Order No. 2009-0009-DWQ, and successor permits. Construction site BMPs will be selected and monitored in accordance with the SWPPP filed for the project by the contractor. The construction site BMPs will be selected based on established criteria and design guidelines outlined in either the Caltrans *Stormwater Quality Handbook* or the CASQA *California Stormwater Quality Best Management Practice Handbooks*.

Construction activity may generate dewatering needs. To the extent practical, permanent retention facilities and other applicable drainage and stormwater facilities may be constructed in the early stages so that they can then serve as the discharge point for dewatering activities. The goal is to fully retain the dewatering activities within these retention facilities. However, to the extent dewatering activity discharges exceed the capacity of the retention facilities or are required to be directly discharged into a surface water, the contractor will be subject to the monitoring and effluent discharge requirements set forth by the California RWQCB, Central Valley Region Order No. R5-2008-0081. If so subject, the contractor will be required to prepare and submit a Pollution Prevention and Monitoring and Reporting Plan (PPMRP) and an NOI to the Regional Board for approval.

2.2.1.1 Monitoring

During construction, a SWPPP and monitoring program will be performed with collected data submitted to RWQCB in compliance with the General Construction Permit. The overall objectives of the monitoring program are to monitor stormwater constituents of concern per the General Construction Permit as determined by project risk assessment level. Appendix B includes more detail on Post-Construction Stormwater Performance Standards.

If dewatering is required and discharges into surface waters are found to be unavoidable, the contractor will be subject to the monitoring and effluent discharge requirements set forth by the California RWQCB, Central Valley Region, and Order No. R5-2008-0081. If so subject, the contractor will be required to prepare and submit a PPMRP and an NOI to the Regional Board for approval.

If it is found necessary for the HMFs to discharge to surface waters, these facilities will be subject to permitting under the SWRCB's General Permit No. CAS000001 (industrial activities), as a transportation facility that conducts vehicle maintenance. Coverage under this permit will require preparation of a site-specific SWPPP and annual monitoring/reporting.

2.2.2 Pollutant Removal

Pollutant removal will be accomplished using treatment BMPs designed to remove pollutants from stormwater runoff prior to discharging (directly or indirectly) to receiving waters. Caltrans requires that permanent treatment BMPs be considered for all new construction and major reconstruction projects. The selection of treatment BMPs for the CHSTP will be using The Caltrans based on the *Project Planning and Design Guide* (PPDG) (Caltrans 2010).

Typically, a project must consider treatment for a targeted design constituent (TDC) when an affected water body within the project limits is on the Clean Water Act Section 303(d) list of impaired water bodies for one or more of the Section 303(d)–listed water quality parameters. A parameter meeting this condition is known as a primary pollutant of concern. The TDCs identified in the PPDG include phosphorus, nitrogen, total and dissolved copper, total and dissolved zinc, total and dissolved lead, and sediments. TDCs also include a category known as general metals, which includes cadmium, nickel, chromium, and other trace constituents such as selenium and arsenic. Table 1.5-2 shows the impaired water bodies in the study area.

The proposed project is not expected to contribute to exotic species, selenium, molybdenum, and toxaphene. However, heavy metals generated by the rail can potentially affect electrical conductivity.

Additionally, turbidity and total suspended solids are two parameters that should be treated in stormwater runoff, and where the project impacts high-traffic highways and arterials, treatment for metals should also be provided.

The Caltrans-approved treatment BMPs considered for the CHSTP include the following:

- Biofiltration swales.
- Biofiltration strips.
- Infiltration devices.
- Detention devices.
- Media filters.
- Multichambered treatment trains (MCTT).
- Wet basins.
- Dry weather diversion.
- Gross solids removal devices (GSRDs).

With the exception of gross solids removal devices, all of these BMPs are considered effective in removing turbidity, total suspended solids, and particulate metals (Caltrans 2010). With the exceptions of gross solids removal and detention devices, these BMPs are also considered effective in removing dissolved metals. Other BMPs may also be considered, if found to be needed or appropriate.

Rail Alignment: These areas are anticipated to contribute minor amounts of heavy metals, oil and grease, and sediments. These areas will also potentially contribute organic compounds and trash and debris.

Passenger Stations: The HST stations themselves will be largely roofed. They involve mostly foot traffic that will generate few pollutants (minor amounts of sediment and trash) and will not need to be significantly treated. The access roads and parking lots will receive motor vehicle traffic. Runoff from these surfaces will require water quality treatment for heavy metals, total suspended solids, and turbidity. Pre-treatment of runoff using an oil/water separation should also be considered for parking lot runoff.

Heavy Maintenance Facilities: The HMF will consist of large, roofed areas and large areas of at-grade track. Runoff from these surfaces will generate very few pollutants and will not need to be treated. Several activities at the HMF will generate pollutants in stormwater runoff that must be treated. It is important that the runoff from the large areas of roofs and train tracks be isolated from untreated runoff from the areas listed below in order to avoid contaminating the relatively clean runoff of the former.

Modified Intersections: The grade separations of the local road system will result in new or replaced paved road surfaces. Stormwater treatment for total suspended solids and turbidity will be provided. Heavy metals treatment will also be provided if a high-traffic volume road is anticipated.

2.2.3 Best Management Practice Design

BMP design depends on the volume and rate of runoff expected, which are affected by the drainage area and configuration, land use, topography, soil characteristics, impervious area, and storm intensity and duration. BMP design is based on a specific design storm and the constituents of concern to be removed. In general, treatment BMPs are designed to treat the flow of smaller, more frequent storm events rather than rare, high-flow events. To design BMPs, the Water Quality Volume (WQV) or Water Quality Flow (WQF) method can be used. Both methods are described below.

WQV is defined in the PPDG as the required active storage capacity of stormwater treatment BMPs. WQV is required in order to size volume-based BMP treatment systems and is intended to provide the level of protection specified by the greater of (1) RWQCB numeric sizing criteria for treatment BMPs or (2) local government guidelines for sizing stormwater treatment BMPs. When no minimum standards have been established by the appropriate RWQCB or local government agency, Caltrans requires a treatment volume

that is sufficient to capture 85% of the annual runoff from the project site. For the study area, the WQV established by Caltrans and the Central Valley RWQCB is 0.50 inch. This value is based on a 48-hour drawdown time and a runoff coefficient of 1.0. The SWRCB recommends using the calculating tool known as Basin Sizer (http://www.water-programs.com/BasinSizer/Basinsizer.htm).

The WQF has been negotiated between the SWRCB and the Central Valley RWQCB, and is used as the basis for designing the approved filtration-type treatment BMPs. For the study area, the WQF will be calculated using the Rational Method and a precipitation rate of 0.20 inch/hour. This rate is designated in the PPDG for the Central Valley RWQCB. The SWRCB recommends using the calculating tool known as Basin Sizer.

Sometimes a flow splitter is utilized to direct WQFs to an off-channel location for stormwater treatment, while allowing peak flows to remain in the channel. Caltrans has drafted design guidelines for flow splitters that direct WQFs and/or WQVs to BMPs while allowing higher flows to bypass (Caltrans 2007a). These guidelines will be followed when designing flow splitters for the CHSTP.

2.2.4 Best Management Practice Evaluation

BMPs will be designed and implemented to reduce the discharge of pollutants from onsite stormwater. Incorporation of BMPs into the onsite drainage system will result in an improvement in water quality from onsite runoff before it enters receiving water bodies. Constraints that will be evaluated during BMP selection and design include the following:

- Right-of-way and topographic constraints (for example, certain BMPs will be preferred due to space limitations or accommodated through onsite grading).
- Storm drain conveyance viability (for example, the feasibility of draining by gravity to existing local stormwater infrastructure will need to be evaluated).
- Outlet locations (for example, releasing directly to major streams will reduce potential erosion on hillsides).
- Land use (for example, BMPs for culturally and biologically sensitive sites will be managed to reduce impacts).

Biofiltration Swales/Strips: Biofiltration swales (bioswales) are open, shallow, vegetated channels that receive directed flow and slowly convey stormwater to downstream discharge points. Biofiltration strips (biostrips) are vegetated sections of land over which stormwater flows as overland sheet flow. Bioswales and biostrips are designed to remove pollutants by straining runoff through the grass or other vegetation in the channel, slowing flow to allow for sedimentation, filtering through a subsoil matrix, adsorption to soil particles, and infiltration into the soil. Swales can be natural or manmade. Biostrips and bioswales are mainly effective at removing debris and solid particles, although some dissolved constituents are removed by adsorption onto the soil. These BMPs are most applicable in areas where site conditions and climate allow for the establishment of vegetation, where flow velocities are low, and where the length of flow through the bioswales or across the biostrips can be maximized. In accordance with the Caltrans Treatment BMP Technology Report (Caltrans 2007b), bioswales have good removal efficiencies for metals and total suspended solids, which are pollutants of concern.

Bioswales will be considered at locations along the alignments where longitudinal slopes are 3% or less and where right-of-way requirements would not conflict with other environmental mitigation. For successful treatment, a bioswale must achieve a minimum hydraulic residence time of 5 minutes. A key consideration in the design of bioswales is to have peak design-flow velocities less than 4 feet/second through the channel to avoid erosion. Much of the alignment is at longitudinal grades less than 1% because of the relatively flat local topography and the need for gradual changes in the vertical track alignment. Such grades generally allow design flows to remain below 4 feet/second. As a result,

bioswales may be considered technically feasible in some locations; however, swales generally require more right-of-way than underground drainage systems and a reliable water supply to sustain design vegetation. These restrictions may limit the use of bioswales and biostrips.

Infiltration Devices: An infiltration basin is a device designed to remove pollutants from surface discharges by retaining stormwater runoff and infiltrating it directly into the soil without release to surface waters. The feasibility criteria for infiltration basins require a design WQV that exceeds 0.1 acre-foot, sufficient soil infiltration rates, sufficiently low water table, and no threat to local groundwater quality. Infiltration basins are a good choice for surface water protection where permeable soils support their use and there is sufficient area or right-of-way.

Currently, most stormwater runoff in the Fresno and Merced vicinities are routed to retention ponds for infiltration. Soils along the HST alignment are highly variable. Soils falling in HSGs A and B are generally suitable for infiltration. HSG C soils may also be suitable if local studies confirm suitable infiltration capability. HSG D soils are generally unsuitable for infiltration due to either poorly infiltrating soils or shallow depth to bedrock or the water table. Further investigation will be required to determine local soil types and infiltration potential. Infiltration basins are common in the Merced and Fresno areas. There is a high potential for HST runoff to be routed to storm drains that lead to existing retention ponds in urbanized areas.

Detention Devices: A detention basin is a permanent device that temporarily detains stormwater runoff under calm, nonturbulent conditions such that sediment and particulates are able to settle before the runoff is discharged. A portion of the detained water is also lost due to infiltration (if the basin is unlined) and evaporation. Detention basins remove litter, settleable solids (debris), total suspended solids, and pollutants that are attached (adsorbed) to the settled particulate matter. Detention basins are primarily suited for sites where the water quality volume is at least 0.1 acre-foot, where the seasonal high groundwater is below the bottom of the basin, and where an elevation difference is available so that water stored in the basin does not cause objectionable backwater conditions in the storm drain systems. Detention basins should be designed to drain within 72 hours so as not to promote vector problems. In accordance with the Caltrans Treatment BMP Technology Report (Caltrans 2007b), detention basins have good removal efficiencies for total metals (mainly those in particulate form) and suspended solids, which are pollutants of concern.

Media Filters: Media filters primarily remove particulates from runoff by sedimentation and filtration, and are effective for removing dissolved metals and litter. Media filters require sufficient hydraulic head (3 feet) to operate by gravity. There are two common types of sand filters:

- Austin sand filters typically have an open top, are designed at grade, and have no permanent water pool. An Austin filter may be configured with earthen or concrete sides. Austin-style media filters are technically feasible for the CHSTP.

- Delaware sand filters are configured with closed concrete chambers to allow the surface above the filter to be hardened for project use. The filter media is below grade and has a permanent pool of water, which is a concern for vector control. Delaware-style media filters are suitable for relatively small drainage areas where surface use over the filter is required, such as may be the case at the passenger stations or the HMF. However, the relatively high cost of Delaware sand filters is a key consideration if they are considered for the CHSTP.

Multichambered Treatment Train: The MCTT is a stormwater treatment device that uses different treatment mechanisms in each of three separate chambers. The MCTT was developed for treatment of stormwater at critical source areas, such as service facilities, parking areas, paved storage areas, and fueling locations. The minimum WQV for MCTTs must be greater than or equal to 0.1 acre-foot. MCTT siting guidelines indicate that they should be considered if the pollutant concentrations are significantly

above those found in the runoff from the state highway system. MCTTs may be appropriate for the HMF and possibly portions of the passenger stations.

Wet Basins: A wet basin is a detention system that comprises a permanent pool of water, a temporary storage volume above the permanent pool, and a shoreline zone planted with aquatic vegetation. Wet basin design requires a minimum WQV of 0.1 acre-foot and a permanent source of water for a permanent pool. It is unlikely that a permanent source of water will be available for a new wet basin facility, and a permanent pool could also cause concerns with vector control. Therefore, a new wet basin is an unlikely BMP choice.

Dry Weather Diversions: Locations that may include irrigation (such as potential planting strips at passenger stations) will include provisions to ensure that over irrigation does not occur.

Gross Solids Removal Devices: Gross solids removal devices remove gross solids (defined as a particle about 5 millimeters square or larger) and are specifically targeted for trash and debris. Gross solids removal devices may be appropriate at the passenger stations or at-grade tracks in urban areas, but debris can often be effectively removed using BMPs for smaller particles.

2.3 Risk Assessment

The new Construction General Permit (discussed in Section 1.3.2) categorizes projects into one of three risk levels according to anticipated discharge of sediment. Risk assessment procedures will be followed as described in the General Permit by completing the risk determination worksheet:

- Step 1. Determine sediment risk.
- Step 2. Determine receiving water risk.
- Step 3. Determine combined risk level.

The Standard Risk Assessment will include utilizing the following:

- Receiving water risk assessment interactive map
- EPA Rainfall Erosivity Factor Calculator website
- Sediment risk interactive map
- Sediment-sensitive water bodies list

The site-specific risk assessment includes the completion of the hand-calculated R-value Risk Calculator. Sediment discharge is based on construction duration and location, as well as the receiving waters' sediment risk. These risk levels will be used to determine whether additional measures are required, including a need for monitoring pH, turbidity, or other constituents. Separate permit applications will be submitted to each RWQCB prior to commencement of construction activities on a linear project, which crosses RWQCB jurisdiction areas.

It should be noted that separate risk assessments should be calculated for projects spanning two or more watersheds. If the assessments are different, the RWQCB may choose to break the project into separate implementation levels as indicated in the Construction Permit.

The FB Section includes several different soil types, slope LS factors, and rainfall R factors. Depending on the final alignment selected, the sediment risk will be classified as Low, Medium, or High. Likely the sediment risk will fall into the Medium category with a general R factor for Fresno near 20, a K factor near 0.45 loam soil, and an LS factor of 6 or more. If the soils are more erodible or the slope steepness and length is longer, then the sediment risk may be High.

The receiving water bodies must meet one of the following requirements to be listed as High risk:

- The disturbed area discharges (either directly or indirectly) to a 303(d)-listed water body impaired by sediment, or
- The disturbed area discharges to a water body with designated beneficial uses of SPAWN & COLD (see Table 1.5-3).

The FB Section does not meet either requirement. There are no discharges to 303(d)-classified water bodies with sediment impairments. There will be no discharge to Poso Creek or Kern River classified as COLD beneficial uses. There are no discharges to water bodies identified as having Cold, Spawning, and Migratory beneficial uses. Therefore, the receiving water risk will be Low.

The Construction Permit uses a combined risk matrix to classify projects as Level 1, Level 2, or Level 3 risk projects with respect to stormwater quality impact. Risk factors include both potential sediment discharge and receiving water body impact. Both factors must be evaluated to determine the combined project risk. Independently, sediment risk for the project is deemed Low, Medium, or High. Similarly, receiving water impact is deemed Low or High. The next step is to use Table 3-1 (similar to that in the General Permit) to determine the combined risk level. The combined risk level will determine the project construction monitoring requirements as illustrated in the General Permit.

Table 3-1
General Construction Permit Combined Risk Level Matrix

Combined Risk Level Matrix				
Receiving Water Risk		**Sediment Risk**		
		Low	**Medium**	**High**
	Low	Level 1	Level 2	
	High	Level 2		Level 3

Table 3-2 represents the potential combined risk level for the HST as proposed. The receiving water body risk is Low, as it does not meet the 303(d) or beneficial uses requirement. The HST has a sediment risk of either Medium or High, depending on the final site specifics, which still place the overall combined risk as Level 2. The project will be subject to monitoring requirements for a Level 2 risk project. Final alignment details may change the risk assessment if a water body is encountered that is either 303(d)-listed for sediment or has beneficial uses of Cold, Spawn, and Migratory.

Table 3-2
Potential Combined Risk Level Matrix for the CHSTP

Combined Risk Level Matrix				
Receiving Water Risk		Sediment Risk		
		Low	Medium	High
	Low	Level 1	Level 2	
	High	Level 2	Level 3	

Project Sediment Risk:	Medium or High
Project RW Risk:	Low
HST Project Combined Risk:	Level 2

Section 3.0

References

3.0 References

BNSF Railway Company. 2007. *Design Guidelines for Industrial Track Project*. October 2007.

California Department of Transportation (Caltrans). 2011. *Highway Design Manual.* August 2011.

Caltrans. 2007a. *Stormwater Quality Handbook: Project Planning and Design Guide*. May 2007.

Caltrans. 2007b. *Treatment BMP Technology Report*.

Caltrans. 2010. *Project Planning and Design Guide*.

Caltrans. 2009. *Stormwater Quality Handbook*.

California Department of Water Resources. 2008. *FloodSAFE Strategic Plan* - Public Review Draft. Available at http://www.water.ca.gov/floodsafe/plan/. June 2008.

California Regional Water Quality Control Board. 2004. *Water Quality Control Plan for the Tulare Lake Basin*, Second Edition. January 2004.

California Stormwater Quality Association (CASQA). 2003a. *Stormwater Best Management Practice Handbooks, Construction*. January 2003.

CASQA. 2003b. *Stormwater Best Management Practice Handbooks, New Development and Redevelopment*. January 2003.

Center for Watershed Protection. 2007. *National Pollutant Removal Performance Database*, Version 3. September 2007.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2004. *Water Quality Control Plan for the Tulare Lake Basin.* Second Edition. January 2004.

City of Hanford. 2006. *California Public Works Construction Standards*. April 2006.

City of Shafter. 2005a. *General Plan.* April 2005.

City of Shafter. 2005b. *Subdivision & Engineering Design Manual*. July 21, 2005.

Department of Water Resources. 2009. *California Water Plan Update*.

Driver, N. E., and G. D. Tasker. 1990. *Techniques for Estimation of Storm Runoff Loads, Volumes and Selected Constituent Concentrations in Urban Watersheds in the United States*. United States Geological Survey, Water Supply Paper 2326.

Endangered Species Recovery Program. 1998. *Recovery Plan for Upland Species of the San Joaquin Valley, California*.

Federal Highway Administration (FHWA). 1988. *Design of Roadside Channels with Flexible Linings Hydraulic Engineering Circular (HEC) 15*. April 1988.

FHWA. 1993. *Design of Bridge Deck Drainage HEC 21*. May 1993.

FHWA. 2001. *Urban Drainage Design Manual HEC 22*. August 2001.

High-Speed Rail Authority and Federal Rail Authority. 2011. *Hydraulics and Floodplain Technical Report*.

Joint Task Force of the Water Environment Federation and the American Society of Civil Engineers, Larry A. Roesner, and Ben R. Urbonas, Chmn. 2000. *Urban Runoff Quality Management*, WEF Manual of Practice No.23. (ASCE Manual and Reports on Engineering Practice No. 87).

Kern County. 2010*. Development Standards*. Updated May 21, 2010.

Kings County. 2003*. Improvement Standards*. May 6, 2003.

Orange County. 2006. *Orange County Model Water Quality Management Plan*. September 2006.

Parsons-Brinckerhoff. 2010. *Technical Memorandum 2.6.5 Hydraulics and Hydrology Design Guidelines*.

Southern California Edison. 2003. *Southern California Edison Borel Hydroelectric Project (FERC Project No. 382)*. Final application for license for Major Project – Existing Dam. Available from: http://www.borel.info/. Accessed: November 3, 2008.

Tulare County. 1991. *Improvement Standards of Tulare County.* Revised December 10, 1991.

United States Army Corps of Engineers (USACE). 1978. *Isabella Lake, Kern River California Reservoir*.

URS/HMM/Arup Joint Venture. 2013. *Draft 15% Design Submission, Floodplain Impact Report, Fresno to Bakersfield*. October 2013.

URS/HMM/Arup Joint Venture. 2013. *Draft 15% Design Submission, Hydrology, Hydraulics, and Drainage Report, Fresno to Bakersfield*. October 2013.

USACE. 1996. *Kaweah River Basin Investigation, California, Draft Environmental Impact Statement Report*. June 1996.

USACE. 2008. *Clarification Guidance on the Policy and Procedural Guidance for the Approval of Modifications and Alterations of Corps of Engineers Projects*.

USACE. 2009. *Water Resource Policies and Authorities, Incorporating Sea-Level Change Considerations in Civil Works Programs*. July 2009.

Western Regional Climate Center. 2010. Retrieved in 2010 from *http://www.wrcc.dri.edu/*.

Appendix A

Best Management Practices

A1.0 Design Best Management Practices

The project will implement site design BMPs and source control BMPs at HST stations and any other relevant buildings, structures, or facilities. The *California Stormwater BMP Handbook* is guidance for these strategies. Site design and source control BMPs are intended to reduce post-project runoff, control sources of pollutants, and retain onsite runoff through infiltration, evapotranspiration, or reuse.

A1.1 Site Design Best Management Practices

Site design BMPs reduces runoff or pollutants at the source through intentional use of landforms and materials. Design elements that improve stormwater management at building sites through the use of site design BMPs are listed in Table A1-1.

Table A1-1
Site Design BMPs

Number	BMP and Objective
SD 1.1	**Maximize permeable area:** Generally, permeable areas are integrated into the design to the maximum extent practicable.
SD 1.2	**Conservation of natural areas:** Any natural areas such as wetlands or upland habitats are preserved.
SD 1.3	**Use of permeable paving or other surfaces**: Paving within parking areas or pedestrian walkways are constructed of pervious material including but not limited to pervious asphalt, paving stones, or crushed aggregates.
SD 1.4	**Designing to minimum widths necessary:** Streets, sidewalks, and parking lot aisles will be designed to the minimum widths necessary, while complying with Americans with Disabilities Act (ADA) regulations and other life safety requirements.
SD 1.5	**Incorporation of landscaped buffers:** Landscape buffers are used between large impervious areas such as roadways, parking lots, and pedestrian walkways to improve safety and aesthetic characteristics, and provide opportunities for stormwater management.
SD 1.6	**Reduced street widths:** Keep any roadway widths to minimums required to accommodate the desired use. Applicable to any maintenance access roadways.
SD 1.7	**Maximize canopy interception:** Plant species with multiple canopy levels to maximize interception of rainfall. Use trees in combination with shrubs and groundcover.
SD 1.8	**Use of native or drought tolerant trees/shrubs:** Native vegetation and drought tolerant vegetation is used to reduce irrigation and associated runoff.
SD 1.9	**Minimizing impervious surfaces in landscaping:** Impervious walkways and plaza areas are set to minimum widths and lengths, as practicable to comply with ADA standards.
SD 1.10 and SD 2.3 (essentially same practice)	**Use of natural drainage systems and vegetated swales:** Use of at-grade drainage systems such as vegetated drainage swales or naturalized channels to convey runoff. These systems typically require more space but are less costly to implement and maintain than gravity storm drain systems. At-grade drainages are surfaced with pervious material to promote infiltration. While at-grade drainages sometimes provide water quality treatment, the majority of at grade drainages will terminate at treatment BMPs.

Table A1-1
Site Design BMPs

Number	BMP and Objective
SD 2.1	**Draining rooftops into adjacent landscaping:** Runoff from rooftops including stations and any parking structures shall drain to landscaped areas rather than directly to storm drains. Landscaped areas shall be designed to receive runoff without causing erosion or structural damage.
SD 2.2	**Draining to adjacent landscaping:** All impervious areas within and around stations shall drain, where practicable to landscaped areas. Landscaped areas shall be designed to receive runoff without causing erosion or structural damage.
SD 2.3	**Vegetated drainage swales:** Vegetated drainage swales shall be implemented in lieu of subsurface drainage pipes to the maximum extent practicable. The drainage swales in most cases will discharge into treatment BMPs.
SD 2.4	**Site drainage system:** The site drainage design incorporates several methods for conveying street and parking area runoff to BMPs.
Source: CASQA, Stormwater BMP Handbooks 2003.	

A1.2 Source Control Best Management Practices

Source control BMPs are measures focusing on reducing or eliminating post-project runoff and controlling sources of pollutants. Source control BMPs can be represented in non-structural measures such as site management requirements, cleaning, education, and maintenance, or in structural measures, such as landscape, irrigation, signage considerations, materials, and design of areas. Routine structural and non-structural source control BMPs are described in Table A1-2 and Table A1-3, respectively.

Table A1-2
Structural Source Control BMPs

Number[1]	BMP and Objective
SC-10	**Site Design and Landscape Planning:** Landscape planning methodologies are incorporated into project design to maximize water storage and infiltration opportunities and minimize surface and groundwater contamination from stormwater.
SC-11	**Roof Runoff Controls:** Direct roof runoff away from paved areas and to pervious areas, cisterns, infiltration trenches, and/or storage areas for reuse to reduce total volume and rate natural infiltration rates at the site.
SC-12	**Efficient Irrigation:** Project plans include application methods to minimize irrigation water discharged into stormwater drainage systems.
SC-13	**Storm Drain System Signs:** Stencils or affixed signs are placed adjacent to storm drain inlets to prevent waste dumping.
SC-20	**Pervious Pavements:** Porous concrete or asphalt, blocks with pervious spaces or joints, or grass or gravel surfaces are employed to reduce runoff volume and provides treatment.
SC-21	**Alternative Building Materials:** Specialized building materials are employed that have lower potential to leach pollutants, and reduce need for future painting or other pollutant generating maintenance activities. For example, some treated wood contains pollutants that can leach out to the environment and some metal roofs and roofing materials result in high metal content in runoff.
SC-30	**Fueling Areas:** Project plans are developed for cleaning, spill cleanup, containment, leak

Table A1-2
Structural Source Control BMPs

Number[1]	BMP and Objective
	prevention, and incorporation of design to reduce rain and runoff that could come in contact with fueling areas.
SC-31	**Maintenance Bays and Docks:** Project design incorporates measures to cover or otherwise eliminate run-on and runoff from bays and docks, and direct connections to storm drain are eliminated.
SC-32	**Trash Enclosures:** Trash storage areas are covered and enclosed to prevent introduction of trash and debris to site runoff.
SC-33	**Vehicle and Equipment Washing Areas:** Designated wash areas or facilities are contained and wash water is reused, treated, or otherwise properly disposed of.
SC-34	**Outdoor Material Storage Areas:** Outdoor storage areas for materials containing pollutants, especially hazardous materials, are covered and enclosed, on impervious surfaces, and include secondary containment when applicable.
SC-35	**Outdoor Work Areas:** Outdoor work areas are covered, contained, and treated as necessary to reduce opportunity of pollutants from work activities to enter stormwater.
SC-36	**Outdoor Processing Areas:** Outdoor processing areas are covered, contained, and treated as necessary to reduce opportunity of pollutants from work activities to enter stormwater.

[1] Numbers correspond to the CASQA's Stormwater BMP Handbook for New Development and Redevelopment
Source: CASQA 2003b

Table A1-3
Non-Structural Source Control BMPs

BMP and Objective
Education for Property Owners, Tenants, and Occupants: Practical informational materials are provided to site managers to improve understanding of stormwater quality, and sources of pollutants.
Activity Restrictions: Rules or guidelines for developments are established within appropriate documents which prohibit activities that can result in discharges of pollutants.
Common Area Landscape Management: Specific practices are followed and ongoing maintenance is conducted to minimize erosion and over-irrigation, conserve water, and reduce pesticide and fertilizer applications.
BMP Maintenance: In order to ensure adequate and comprehensive BMP implementation, all responsible parties are identified for implementing all non-structural BMPs and for structural BMPs, cleaning, inspection, and other maintenance activities are specified including responsible parties for conducting such activities.
Title 22 CCR Compliance: Hazardous waste is managed properly through compliance with applicable Title 22 regulations.
Local Water Quality Permit Compliance: The project complies with Permits issues under the Water Quality Ordinance to ensure clean stormwater discharges from fuel dispensing areas and other areas of concern on public properties.
Spill Contingency Plan: A spill contingency plan is prepared for any hazardous chemicals or materials handled at the site.
Underground Storage Tank Compliance: The project is not anticipated to include underground storage tanks; therefore, compliance with UST policies and regulations is not applicable.

Table A1-3
Non-Structural Source Control BMPs

BMP and Objective
Hazardous Materials Disclosure Compliance: Measures shall be taken to comply with applicable local, state, and federal regulation to avoid harm to humans and the environment from the handling and storage of hazardous materials or wastes.
Uniform Fire Code Implementation: The project shall comply with Article 80 of the Uniform Fire Code regarding hazardous material storage facilities.
Common Area Litter Control: Trash management and litter control procedures are specified, including responsible parties, and implemented to reduce pollution of drainage water.
Employee Training: Practical informational materials and/or training are provided to employees to increase their understanding of stormwater quality, sources of pollutants, and their responsibility for reducing pollutants in stormwater.
Housekeeping of Loading Docks: Cleaning and cleanup procedures are specified and implemented for loading dock areas to keep the area free for pollutants and reduce associated pollutant discharges.
Drainage Facility Inspection: Inspection procedures, schedules, and responsibilities are established for drainage facilities to ensure regular cleaning, inspection, and maintenance.
Street Sweeping Private Streets and Parking Lots: Street sweeping frequency and responsible parties are identified and regular sweeping is conducted to reduce pollution of drainage water.
Retail Gasoline Outlets: Specific operational and maintenance BMPs are implemented to the extent feasible to reduce potential for pollutant discharge from wash off by runoff, leaks, and spills.
Sources: CASQA 2003. Orange County Model Water Quality Management Plan, Orange County 2006.

A2.0 Construction Best Management Practices

During construction activities, the use of construction materials and chemicals has the potential to contribute to stormwater pollution. Erosion control, sediment control, wind, and tracking control technologies can be used to minimize pollutants. Tables A2-1, A2-2, and A2-3 list typical construction BMPs that may be used on this project.

Table A2-1
Erosion Control BMPs

Number	BMP and Objective
EC-1	**Scheduling:** The project shall develop a written plan including sequencing of construction activities and implementation of erosion control and sedimentation BMPs.
EC-2	**Preservation of Existing Vegetation:** Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.
EC-3	**Hydraulic Mulch:** Application of a mixture of shredded wood fiber or hydraulic matrix, and a stabilizing emulsion or tackifier to temporarily protects exposed soil from erosion by raindrop impact or wind.
EC-4	**Hydroseeding:** Application of a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion to temporarily protect exposed soils from erosion by water and wind.
EC-5	**Soil Binders:** Soil binders are soil stabilizers applied to soil surfaces to temporarily protect exposed soils from erosion by water and wind.
EC-6	**Straw Mulch:** Placement of a uniform layer of straw into the soil with a studded roller or tackifier stabilizing emulsion to protect the soil surface from the impact of rain drops.
EC-7	**Geotextiles and Mats:** Mats made of natural materials are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place and absorb and hold moisture near the soil surface. Mats may be used to cover stockpiles of soil on the site.
EC-8	**Wood Mulching:** Application of a mixture of shredded wood mulch, bark or compost to disturbed soils to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.
EC-9	**Earth Dikes and Drainage Swales:** A berm or channel that is used to divert site runoff. Drainage swales will be used along the alignment to capture stormwater from the rail track construction.
EC-10	**Velocity Dissipation Devices:** Velocity dissipation devices such as rock, grouted riprap, or concrete rubble are placed at the outlet of a pipe or channel to prevent scour of the soil from high velocity flows. Velocity dissipation devices will be used to dissipate energy from stormwater that is routed to the ground level from the elevated rail structures.
EC-11	**Slope Drains:** Pipes are used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from sensitive areas.
EC-12	**Streambank Stabilization:** BMPs applied directly to watercourses can reduce the impacts of construction activities on sensitive channels and watercourses. Numerous BMPs, including some of those listed above, can be applied directly to streams.
EC-13	**Polyacrylamide:** Polyacrylamide (PAM) is a chemical that can be applied to disturbed soils at construction sites to reduce erosion and improve settling of suspended sediment. PAM increases the soil's available pore volume, thus increasing infiltration and reducing the quantity of stormwater runoff that can cause erosion. PAM typically is used in conjunction with other BMPs to increase their performance.

Table A2-2
Sediment Control BMPs

Number	BMP and Objective
SE-1	**Silt Fence:** A filter fabric that has been entrenched and attached to supporting poles, used to detain water and promote sedimentation behind the fence. Silt fences are typically used along the perimeter of disturbed soil areas.
SE-2	**Sediment Basin:** A temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained to allow sediment to settle out before discharge.
SE-3	**Sediment Trap:** A containment area formed by excavating or constructing an earthen embankment across a waterway or low drainage area to allow sediment to settle out or before the runoff is discharged.
SE-4	**Check Dam:** A small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch to reduce the velocity of flowing water.
SE-5	**Fiber Rolls:** Straw, flax, or other similar materials bound into a tight tubular roll and placed at the toe and on the face of slopes to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment.
SE-6	**Gravel Bag Berm:** A series of gravel-filled bags placed on a level contour to intercept sheet flows allowing sediment to settle out, and release runoff slowly, preventing erosion.
SE 7	**Street Sweeping and Vacuuming:** The use of self-propelled and walk behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving.
SE-8	**Sand Bag Barrier:** A series of sand-filled bags placed on a level contour to intercept sheet flows. Similar to SE-6.
SE-9	**Straw Bale Barrier:** A series of straw bales placed on a level contour to intercept sheet flows.
SE-10	**Storm Drain Inlet Protection:** A sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle.
SE-11	**Chemical treatment:** Application of chemicals to stormwater to aid in the reduction of turbidity caused by fine suspended sediment. Typically, chemical use is limited to waters with numeric turbidity standards.

Table A2-3
Wind Control and Tracking Control BMPs

Number	BMP and Objective
Wind Erosion BMP	
WE-1	**Wind Erosion Control:** Application of water or other dust palliatives to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.
Tracking Control BMPs	
TR-1	**Stabilized Construction Entrance/Exit:** A point of entrance to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.
TR-2	**Stabilized Construction Roadway:** Stabilization and frequent maintenance of access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes immediately after grading.
TR-3	**Entrance/Outlet Tire Wash:** An area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Table A3-1
Non-Stormwater BMPs

Number	BMP and Objective
NS-1	**Water Conservation Practices:** Activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants off site.
NS-2	**Dewatering Operations:** Activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants off site. These practices can reduce or eliminate non-stormwater discharges.
NS-3	**Paving and Grinding Operations**: Measures to prevent or reduce the discharge of pollutants from paving operations by preventing run-on and runoff pollution, properly disposing of wastes, and training employees and subcontractors.
NS-4	**Temporary Stream Crossing:** A temporary culvert, ford, or bridge placed across a waterway to provide access for construction purposes for a period of less than one year to eliminate erosion and downstream sedimentation caused by vehicles.
NS-5	**Clear Water Diversion:** A system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation.
NS-6	**Illicit Connection/Discharge:** Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.
NS-7	**Potable Water/Irrigation:** Practices to manage the discharge of pollutants generated during discharges from irrigation water lines, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.
NS-8	**Vehicle and Equipment Cleaning:** Procedures to reduce the discharge of pollutants from vehicle and equipment cleaning operations. These include using offsite facilities; washing in designated, contained areas; eliminating discharges to the storm drain; and employee training.
NS-9	**Vehicle and Equipment Fueling:** Procedures designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater.
NS-10	**Vehicle and Equipment Maintenance:** Reduction of contamination of stormwater resulting from vehicle and equipment maintenance by maintaining a dry and clean maintenance site or providing maintenance off site.
NS-11	**Pile Driving Operations:** Proper control and use of equipment, materials, and waste products from pile driving operations to reduce or eliminate the discharge of potential pollutants.
NS-12	**Concrete Curing:** Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. Proper procedures reduce or eliminate the contamination of stormwater runoff during concrete curing.
NS-13	**Concrete Finishing:** Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.
NS-14	**Material Over Water:** Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse.
NS-15	**Demolition Adjacent to Waters:** Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.
NS-16	**Temporary Batch Plants:** Proper control and use of equipment, materials, and waste products from temporary batch plant facilities will reduce the discharge of potential pollutants to the storm drain system or watercourses.

Table A3-2
Waste Management and Materials Pollution Control BMPs

Number	BMP and Objective
WM-1	**Material Delivery and Storage:** Reduce discharge of pollutants from material delivery and storage by minimizing storage of hazardous materials on site, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.
WM-2	**Material Use:** Reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use on site, and training employees and subcontractors.
WM-3	**Stockpile Management:** Reduce stormwater pollution from stockpiles of construction materials through appropriate placement, wind and water protection, and drainage design.
WM-4	**Spill Prevention and Control**: Prevent the discharge of pollutants from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.
WM-5	**Solid Waste Management:** Practices designed to prevent discharge of pollutants from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.
WM-6	**Hazardous Waste Management:** Prevent the discharge of pollutants from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.
WM-7	**Contaminated Soil Management**: Prevent the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavation regularly, and remediating contaminated soil.
WM-8	**Concrete Waste Management:** Conduct washout off site, performing onsite washout in a designated area, and training employee and subcontractors.
WM-9	**Sanitary/Septic Waste Management:** Provide convenient, well maintained sanitary facilities, and arrange for regular service and disposal.
WM-10	**Liquid Waste Management:** Practices which prevent discharges as a result of the creation, collection, and disposal of non-hazardous liquid wastes such as drilling slurries, rinse water, and dredgings.

This page intentionally left blank.

Appendix B

Risk Level 2 Requirements

(General Permit Attachment D)

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

a. Stormwater discharges and authorized non-stormwater discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

b. Dischargers shall minimize or prevent pollutants in stormwater discharges and authorized non-stormwater discharges through the use of controls, structures, and management practices that achieve Best Available Technology Economically Achievable for toxic and non-conventional pollutants and Best Conventional Pollutant Control Technology for conventional pollutants.

B. Numeric – Risk level 2 dischargers are subject to a pH numeric action level of 6.5-8.5, and a turbidity NAL of 250 NTU.

C. Good Site Management "Housekeeping"

Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e., poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e., soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e., poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the offsite tracking of loose construction and landscape materials.

Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the stormwater drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the stormwater drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and nonhazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

   i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

   ii. Appropriate spill response personnel are assigned and trained.

   iii. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

c. Clean leaks immediately and disposing of leaked materials properly.

Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

b. Contain all fertilizers and other landscape materials when they are not actively being used.

c. Discontinue the application of any erodible landscape material within two days before a forecasted rain event or during periods of precipitation.

d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in stormwater discharges and authorized non-stormwater discharges. This

potential pollutant list shall be kept with the SWPPP and shall identify occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with stormwater.

c. Consider the direct and indirect pathways that pollutants may be exposed to stormwater or authorized non-stormwater discharges. This consideration shall include an assessment of past spills or leaks, non-stormwater discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in stormwater discharges and authorized non-stormwater discharges.

Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

Additional Risk Level 2 Requirement: Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and Rain Event Action Plan(s) (REAP) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

D. Non-Stormwater Management

Risk Level 2 dischargers shall implement measures to control all non-stormwater discharges during construction.

Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-stormwater discharges to surface waters or MS4 drainage systems.

Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-stormwater discharges from reaching surface water or MS4 drainage systems.

E. Rain Event Action Plan

Additional Risk Level 2 Requirement: The discharger shall ensure a qualified SWPPP preparer (QSP) develop a REAP 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

Additional Risk Level 2 Requirement: The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

Additional Risk Level 2 Requirement: The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

a. Site Address

b. Calculated Risk Level (2 or 3)

c. Site Stormwater Manager Information including the name, company, and 24-hour emergency telephone number

d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number

e. Stormwater Sampling Agent information including the name, company, and 24-hour emergency telephone number

f. Additional Risk Level 2 Requirement: The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

g. Activities associated with each construction phase

h. Trades active on the construction site during each construction phase

i. Trade contractor information

j. Suggested actions for each project phase

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

   a. Site Address

   b. Calculated Risk Level (2 or 3)

   c. Site Stormwater Manager Information including the name, company, and 24-hour emergency telephone number

   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number

   e. Stormwater Sampling Agent information including the name, company, and 24-hour emergency telephone number

   f. Trades active on site during Inactive Construction

   g. Trade contractor information

   h. Suggested actions for inactive construction sites

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available on site no later than 24 hours prior to the likely precipitation event.

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain on site a paper copy of each REAP on site in compliance with the record retention requirements of the Special Provisions in this General Permit.

F. Risk Level 2 Monitoring and Reporting Requirements

Table B-1
Summary of Monitoring Requirements

Risk Level	Quarterly Non-Stormwater Discharge	Visual Inspections Pre-Storm Event Baseline and REAP	Daily Storm BMP	Post Storm	Sample Collection-Stormwater Discharge	Sample Collection-Receiving Water
2	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the SWPPP, included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Quality Control Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. Objectives

   a. The CSMP shall be developed and implemented to address the following objectives:

      i. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable numeric action levels (NALs)/numeric effluent limitations (NELs) of this General Permit.

      ii. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

      iii. To determine whether immediate corrective actions, additional BMP implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges.

      iv. To determine whether BMPs included in the SWPPP/ REAP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

G. Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events

Risk Level 2 dischargers shall visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained stormwater that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

a. All stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

b. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

c. Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

d. For the visual observations (inspections) described above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

e. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

f. Risk Level 2 dischargers shall maintain onsite records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

Risk Level 2 – Water Quality Sampling and Analysis

a. Risk Level 2 dischargers shall collect stormwater grab samples from sampling locations, as defined in General Permit Section I.5. The stormwater grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect three samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained stormwater are from discharges subsequent to a qualifying rain event (producing precipitation of 0.5 inch or more at the time of discharge).

d. Stormwater Effluent Monitoring Requirements

    i. Risk Level 2 dischargers shall analyze their effluent samples for:

    ii. pH and turbidity.

H. Risk Level 2 – Stormwater Discharge Water Quality Sampling Locations

1. Risk Level 2 dischargers shall perform sampling and analysis of stormwater discharges to characterize discharges associated with construction activity from the entire project disturbed area.

2. Risk Level 2 dischargers shall collect effluent samples at all discharge points where stormwater is discharged off site.

3. Risk Level 2 dischargers shall ensure that stormwater discharge collected and observed represent4 the effluent in each drainage area based on visual observation of the water and upstream conditions.

4. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

5. Risk Level 2 dischargers who deploy an active treatment system (ATS) on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

6. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.

7. All stormwater sample collection preservation and handling shall be conducted in accordance with Section I.7 "Stormwater Sample Collection and Handling Instructions" in Appendix B of the General Construction Permit.

I. Risk Level 2 – Visual Observation and Sample Collection Exemptions

1. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 of Appendix B of the General Construction Permit are completed. Risk Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

   a. During dangerous weather conditions such as flooding and electrical storms.

   b. Outside of scheduled site business hours.

2. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

J. Risk Level 2 – Stormwater Sample Collection and Handling Instructions

1. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

2. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

3. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's 2008 Quality Assurance Program Plan.

This page intentionally left blank.